Industry and Power

September 1954

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A correctly designed spray system on a plant roof can cut cooling cost 51

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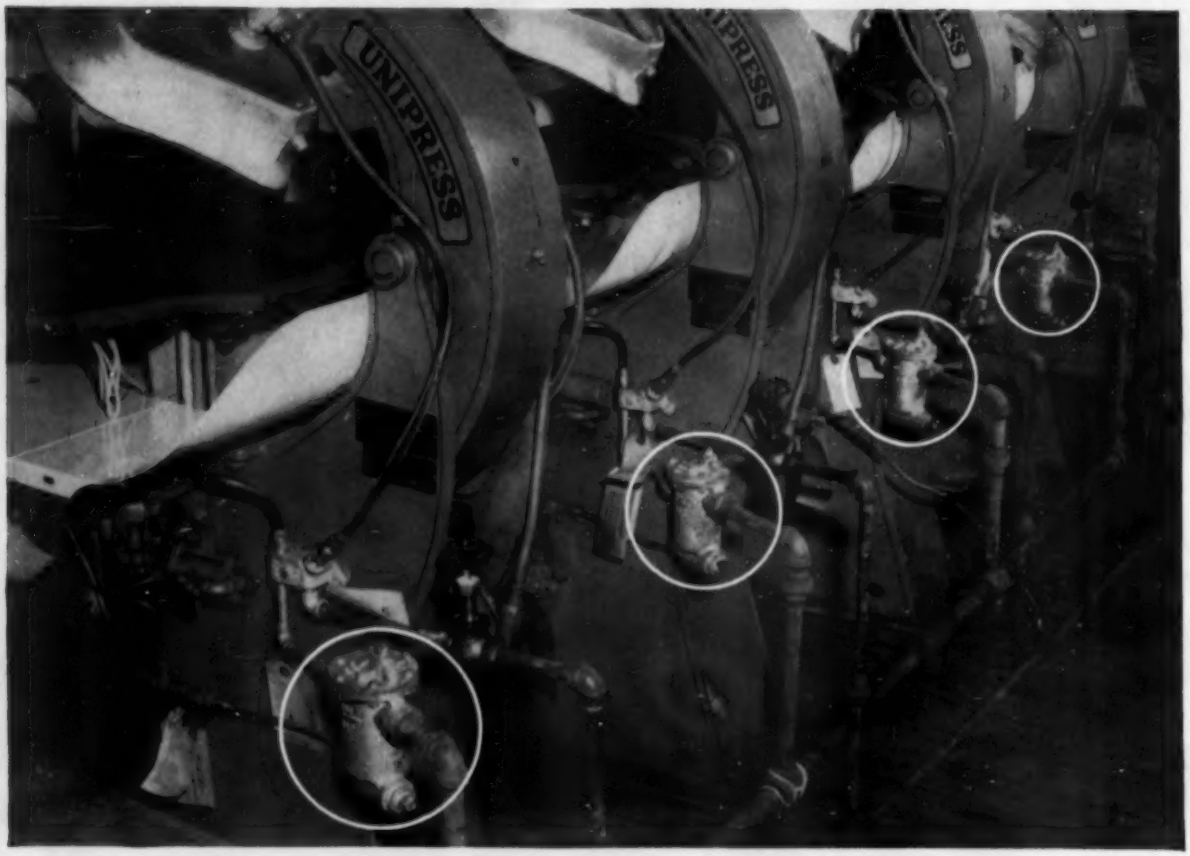
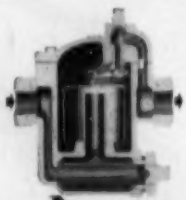
for engineers and executives responsible for

— engineered plant facilities

You can't save money by skimping on Steam Traps— An Armstrong Trap *on every unit* always pays dividends



Plant doubles production without appreciable increase in fuel costs



STRAINER BUILT IN

Built-in Strainer Traps save fittings, labor, maintenance. Cost less than separate trap and strainer. Complete data in literature mentioned below.

When Standard Coat, Apron & Linen Service took over a previous linen service plant in Portland, Maine, the boilers could hardly handle the steam load. Mr. Tom Foley, General Mgr. called Files Steam Specialty Company, Armstrong Trap Representative in New England, to help correct the condition.

Under supervision of Mr. Ken Raymond, Chief Engineer, Armstrong traps were installed on *each* unit in the plant.

Results: doubled production with no appreciable increase in fuel consumption; higher machine temperatures; boilers easily handle the load.

This is a typical example of the efficiencies and economies possible through Armstrong unit trapping. Could your plant stand a shot in the arm? Call your Armstrong Representative, or write:

ARMSTRONG MACHINE WORKS
820 Maple Street, Three Rivers, Michigan

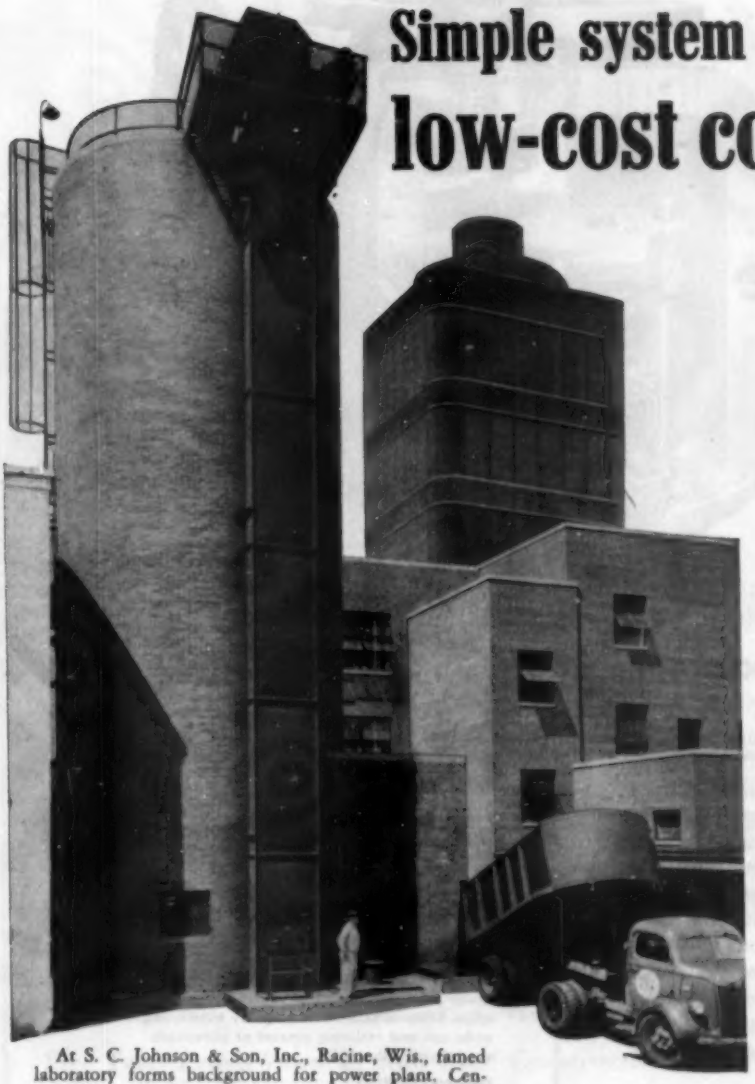
SEND FOR FREE CATALOG

—The "Steam Trap Book" contains 44 pages of trap data—selection, maintenance, trouble-shooting. Free on request. Or Consult Sweets or CEC.

ARMSTRONG STEAM TRAPS

Circle 500 on Reply Card for more data

Simple system spells low-cost coal handling for small power plant



At S. C. Johnson & Son, Inc., Racine, Wis., famed laboratory forms background for power plant. Centrifugal discharge bucket elevator handles 40 tph.

Apron conveyor loads bucket elevator. Live or dead storage is fed by elevator.

From elevator, coal is moved by 12 in. screw conveyor atop storage silo.

Weigh larry delivers coal from discharge chute to three stoker hoppers.

LINK-BELT equipment at S. C. Johnson & Son, Inc. provides clean, efficient operation

THE compact, economical coal handling provided for the makers of Johnson's wax is typical of hundreds of Link-Belt power plant installations. Large or small — your plant, too, can get the added efficiency of modern, mechanized equipment.

Link-Belt's experience is based on years of success in meeting every type of coal handling problem. This vast background, combined with a complete line of coal handling equipment, is your assurance of a system that's right for your needs. And Link-Belt's quality products have earned a reputation for dependable, long-life service. See your nearest Link-Belt office for a copy of Book 2410, showing many typical, modern power plant layouts.

LINK-BELT

COAL HANDLING EQUIPMENT

LINK-BELT COMPANY: Plants: Chicago, Indianapolis, Philadelphia, Colmar, Pa., Atlanta, Houston, Minneapolis, San Francisco, Los Angeles, Seattle; Scarboro, Toronto and Elmira, Ont. (Canada); Springs (South Africa); Sydney (Australia). Sales Offices in Principal Cities. 13.350

Circle 501 on Reply Card for more data

Cochrane
MULTIPORT RELIEF VALVES

Assure

dependability . . . maximum safety . . . lower maintenance

Cochrane Multiport Valves guarantee uniform regulation of line over-pressure with maximum safety. The use of multiple *vapor cushioned* discs, made of corrosion-resistant metals, prevents possible valve failures. Valves will not rust, freeze or jam. Valves operate automatically and positively.

As set pressure is exceeded, the *vapor cushioned* valve discs ride open gradually with the over-pressure . . . eliminates heavy pulsations in the line that would be transmitted to heater and other equipment. When only the *exact amount* of over-pressure is bled off, valve discs close gradually and *gently* to pre-set pressure, eliminating back surge, blowdown or vapor hammer.

Vertical, horizontal or angle Multiport Valves are available for pressures 0 to 25 psig, 0 to 60 psig, 0 to 100 psig. Hand wheel or chain wheel control easily accomplishes valve adjustment from zero to required pressure. Cochrane Multiport Relief Valves are for pressure or back pressure relief to atmosphere service, but also have application in closed systems as Check Valves or Differential Pressure Spill-over Valves, also as Vacuum Breakers. *Write for Publication 5200.*

Other Cochrane Processes

HOT ZEOLITE SOFTENERS

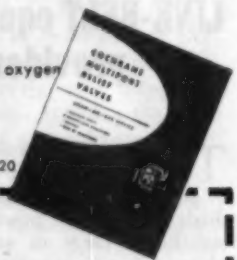
Complement present Hot Process Softeners by utilization of high temperature ion exchange resins. Provide water of zero hardness; lower alkalinity; minimize carbon dioxide and silica. Effect substantial savings by eliminating soda ash and reducing amount of phosphate used. Publication 4801.

DEMINERALIZERS

Cochrane ion exchange units deliver a continuous supply of demineralized silica-free water at extremely low cost. Publication No. 5800.

DEAERATORS

Delivers deaeratedwater with an oxygen content not to exceed 0.005 cc. per litre—less than 7 parts per billion! Publications 3305 and 4643.



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Please send me a copy of Publication No. 5200 on Cochrane MULTIPORT VALVES. I would also appreciate the following publications:

☐ 4801 ☐ 5800 ☐ 3305 and 4643.

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CORPORATION

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Representatives in 30 principal cities in U. S.; Toronto, Canada; Mexico City, Mexico; Paris, France; Havana, Cuba; Caracas, Venezuela; San Juan, Puerto Rico; Honolulu, Hawaii.

Pottstown Metal Products Division—Custom built carbon steel and alloy products

Demineralizers • Hot Process Softeners • Hot Zeolite Softeners • Dealkalizers • Reactors • Deaerators • Continuous Blow-Off • C-B Systems • Specialties

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Meet the PROTO "Maintenance Master"

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Extensive field research among maintenance men in all industries has resulted in the new PROTO "Maintenance Master," designed to the specifications of the men who use it. You will appreciate the great efficiency possible with this set because each tool was selected for its ability to perform on many jobs. The 9901, with its famous PROTO *Professional Quality*, is a set you will be proud to own. The tools are properly forged and heat treated for safety and long life. Their advanced designs are real time savers and their guarantee protects your investment. It will pay you to compare the completeness of the No. 9901 with your present tools or buy one from your PROTO dealer. Send 10¢ for 68-page catalog to

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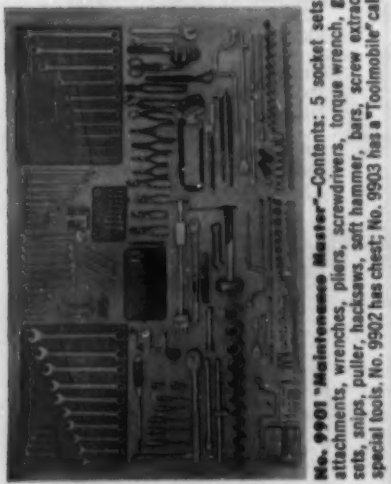


No. 9901 "Maintenance Master"—Contents: 5 socket sets and attachments, wrenches, pliers, screwdrivers, torque wrench, gauge sets, snips, puller, hacksaws, soft hammer, bars, screw extractors, special tools. No. 9902 has chest; No. 9903 has a "Toolmobile" cabinet.

Circle 503 on Reply Card for more data

acorns

. . . recently announced . . . worth watching

Lightweight Diesels

● The Packard Motor Car Co. announces the establishment of a broad engineering project to develop new type, lightweight, diesel engines that promise attractive operating advantages. May find wide acceptance for industrial uses.

Aluminum-To-Ceramic

● Lightweight aluminum can now be used in place of heavier conventional metals in many electrical applications as the result of a new aluminum-to-ceramic joining process. The process can be used to advantage in the making of capacitors, high speed relay switches, aircraft instrument panels, ignition systems, and other items requiring hermetic seals. Tests have shown that this hermetic seal is capable of withstanding high impact shock, vibration, and corrosion.

For Bird-Haters

● An effective bird-repellent has been developed. The product, dispensed on likely landing places in the form of a ribbon of foam, is a gelatin compound that is said to be harmless to birds but so disagreeable underfoot that the birds will avoid it. In addition, it's odorless and harmless to human beings, will cling to any metal, hard stone, wood, or other building material without staining, and will remain potent for a year or more.

Magic Eye

● A capacitance recorder enables pipeline men to look into a pipe and tell what is passing through. The instrument offers a continuous check on pipeline contents, even differentiates between two grades of gasoline. The device functions by revealing variations in electrical properties of fluids as they pass between two electrodes within the pipe. Changes are recorded on a clock-driven chart and appear as variations on the record for later analysis.

Every Man an Engineer

● A method introduced by the Armour Research Foundation simplifies transformer design to use of an alignment chart, or nomograph, and some standardized equations. The system enables even inexperienced engineers to design new transformers for specific uses in a matter of hours instead of weeks.

Pipe Corrosion

● The National Bureau of Standards has recently completed a long-range study of the corrosion of nickel cast iron in soils. From measurements on pipe specimens after exposure to different soil conditions for periods up to 11 years, it has been possible to evaluate the effect of varying amounts of nickel in the castings. With the completion of this work, data becomes available for exposures up to a maximum of 11 years for specimens of low-alloy cast iron, and up to a maximum of 14 years for specimens of high-alloy cast iron.

Longer Battery Life

● The Electric Storage Battery Co. revealed the existence of industrial batteries lasting more than 17 years. Previously, seven years had been the best life normally attainable in the same service.

Recently granted patents describe the alloying of lead with varying and precisely controlled quantities of antimony, arsenic, and silver, and use of these alloys in the grid structure of battery plates.

According to the patent, the 17-year case histories cover batteries maintained on "float," as is done in hundreds of industrial and stationary power applications.

Clad Metals Compete

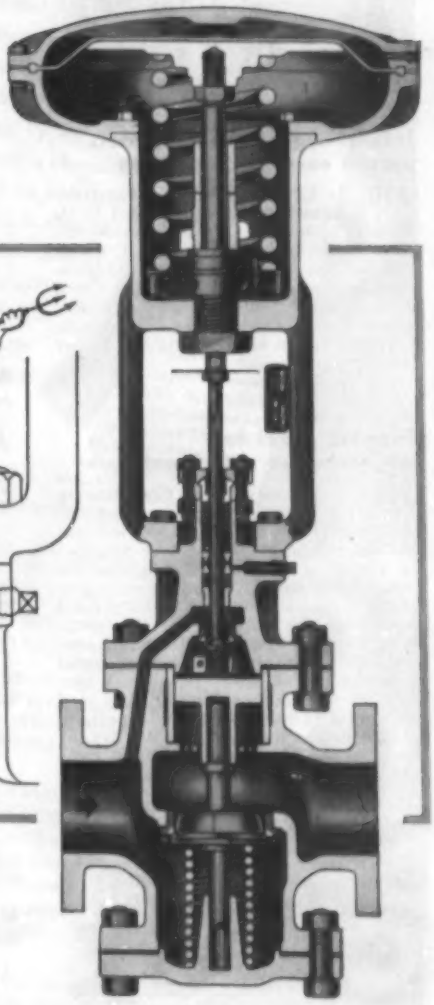
● Silver clad brass and silver clad phosphor bronze, with the layer of silver as thin as 10 millionths of an inch, are currently being produced by the American Silver Co. These new composite metals are designed to replace silver electroplating, which constantly presents problems of high production costs.

Turbine Horizons

● The country's first turbine powered bus has been outfitted as a research tool to inquire into the possibilities of the turbine replacing piston engines. Built by GM, the "Turbo-cruiser's" engine supplies nearly twice as much power as a comparative diesel while saving more than 1,500 pounds in engine weight alone.

PACKING PROBLEMS?

The new Leslie Lubrisoft® Packing now standard in all Leslie Diaphragm Control Valves is recommended for valve body temperatures up to 500° F. *without external lubrication.* When used with the Leslie thermo-isolating bonnet, it may be used for valve body temperatures up to 1050° F., eliminating need for external lubricators and isolating valves in most applications.



LESLIE LUBRISOFT® PACKING "BEATS THE DEVIL" OUT OF ALL 8 MOVING STEM SEAL PROBLEMS

Each of the several types of Lubrisoft split ring packing is specifically designed to maintain the low-friction stem seal against one or more of these deteriorative service conditions:

1. Internal pressure, temperature and fluid
2. Contamination
3. Corrosion
4. Electrolytic Action
5. Oxidation
6. Extrusion
7. Abrasion
8. Friction

Overall result is a standard, economical packing, with superior stem sealing properties and long service life. Precision fabricated to conform exactly to the deep stuffing box dimensions, the positive, split ring design makes fast replacement possible, without disturbing body or stem adjustment.

Plan to reduce control valve maintenance costs by sending for Bulletin 5304 Diaphragm Control Valves.

LESLIE CO., 263 GRANT AVENUE • LYNDHURST, NEW JERSEY

LESLIE VALVES

"STILL FAR AHEAD IN QUALITY AND PERFORMANCE"

Circle 504 on Reply Card for more data

new equipment

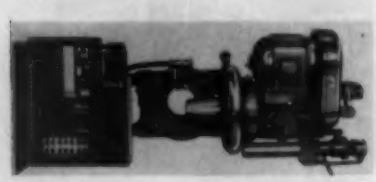
. . . new developments

Interchangeable side panels permit easy field adaption

J10 L. C. Wing Mfg. Co. has redesigned the Wing Furnace Draft Inducer to include interchangeable side panels, moveable mounting feet, motor and fan assembly completely withdrawable, spring-mounted motor and V-belt drive to prevent mis-alignment, variable speed motor, and pre-sealed bearings. Capacity range is up to 100,000 lb per hour.

Graphic panel for ion exchange equipment

J11 Graver Water Conditioning Company's Graphic panel arrangement for all automatic ion exchange equipment allows the operator to see at a glance if the system is functioning properly. The ion exchange units, immediate piping, and valves are represented by different colored lights. Where a pipe line carries two different materials, a different color or pictorial arrangement is used. The panel also includes the usual controls, meters, and recorders. This system is especially advantageous for large utility demineralization plants, mixed-bed and two-bed demineralizers, and hydrogen sodium blend systems.



Equalizing valve improves automatic start on #6 oil

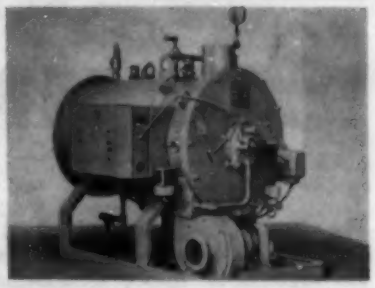
J12 Design feature of the Preferred Model BHE horizontal rotary heavy oil burner is the Equalizing Valve which improves automatic start on #6 oil, being especially effective in improving combustion at all firing rates, where catalytic #6 oils have not been raised to the temperatures required for complete combustion. It is completely factory wired and assembled, compact, and ready for easy installation, with capacities of the ten sizes ranging from 15 to 175 gph. Preferred Utilities Manufacturing Corp.

Abrasive fluid service valves reduce maintenance costs

J13 The 2000 psi capacity WP Mudwonder alloy steel mudline valves being introduced by Edward Valves, Inc., offer many advantages for any type of abrasive fluid service. They are said to cut down-time, disassemble and assemble easily, keep piping hook-up fixed throughout drilling operation, seal drop-tight, operate easily and quickly, stop sanding or settling of solids in valve, give longer service, and reduce maintenance costs and labor.

Miniature transformer designed for meters and instruments

J14 Butyl-molded miniature current transformer known as the JCA-O, features both window-type and bar-primary construction. The transformer can be used on any circuit of 600 v or below. It is designed for operating meters and instruments and can be used on either single-phase two-wire or polyphase circuits. Made by General Electric Co., the unit can be mounted in almost any position.

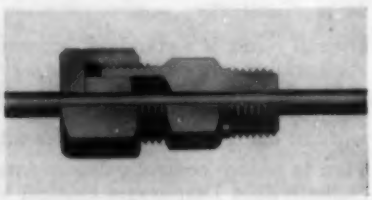


Packaged generators meet need for smaller capacities

J15 To answer demand for an economical, automatic source of steam or hot water for operations requiring smaller capacities, Ames Iron Works, Inc. is introducing the Model TP Steam Generator in seven sizes from 15 to 60 hp, for firing with light oil, gas or light oil-gas combinations. Units are fully piped and wired and need only be connected to service lines and to breaching or stack.

Three types of extension wire added to line

J16 Addition of three types of extension wire to the product line of Minneapolis-Honeywell Regulator Company's Industrial Div. is announced: 14-gage extension wire with asbestos or waterproof insulation; and 20-gage Chromel-Alumel extension wire with waterproof insulation. This 20-gage wire, used with Chromel-Alumel thermocouples is useful in restricted space areas — ½ in. conduit will carry six 20-gage cables in contrast with four 16-gage cables.



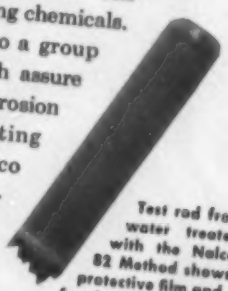
Packing gland utilizes soft sealant

J17 Packing Gland Model PG-5 designed by Conax Corp. eliminates damage to tubes by use of soft packing material as sealtant and provides for increasing minimum bore in

NOTE—Each new product item has a key number for your convenience in asking for additional, detailed information. Circle this number on Reply Card, pages 34/35 & 98/99.

Forest of Facts on Nalco® RECIRCULATING WATER TREATMENT

NALCO Laboratories' continuous research program has gathered this forest of facts about protecting recirculating water systems. In the search for the most effective *and economical* formula, the metal rods shown have been rotated in all types of recirculating waters and treating chemicals. Results pointed the way to a group of Nalco Treatments which assure users against scale and corrosion in virtually any recirculating waters. For details on Nalco Treatment to fit your particular system, call your Nalco Representative, or write direct.



Test rod from water treated with the Nalco 82 Method shows protective film and freedom from any scaling or corrosive attack.

THE Nalco 82 METHOD MAY BE THE ANSWER FOR YOU

The Nalco 82 Method is particularly suitable for scale and corrosion control in recirculating water systems which fall within the characteristic limits given here. Check them to see if your system should have Nalco 82 Treatment:

- Equipment to be protected contains steel and/or brass.
- Hardness of makeup water is more than 50 ppm; and sulphates and chlorides, as sodium salts, are less than 150 ppm.
- Calcium hardness of makeup can be as much as 500 ppm.
- Silica content of makeup water up to 50 ppm.
- Total alkalinity of makeup more than 40 ppm.
- Recirculation rates between 100 and 100,000 g.p.m.
- Where non-toxic waste water is required.

Act today to get the certain, low-cost protection of The Nalco System. Full data on Nalco 82 in free Bulletin 68.

NATIONAL ALUMINATE CORPORATION

6218 West 66th Place • Chicago 38, Illinois

In Canada: Alchem Limited, Burlington, Ontario

THE Nalco SYSTEM . . . Serving Industry through Practical Applied Science

Circle 585 on Reply Card for more data

for Rust-Free Hot Water

look for the Copper Lining—

they did at the

New 525 Wm. Penn Place Building

Take a tip from men who specify hot water storage heaters for America's important buildings: "look for the p-k copper lining."

High above Pittsburgh's famed Golden Triangle, towers a glistening new skyscraper. This magnificent 41 story structure houses the main offices of the United States Steel Corporation and the Mellon Banking interests. From tower to basement, 10 p-k copper-lined storage heaters provide an abundant supply of rust-free hot water.

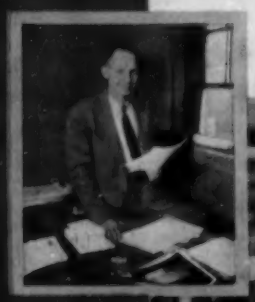
These heaters have been in operation since the building opened in 1952. Because of the corrosiveness of water in the area, the performance record of the heaters is already noteworthy.

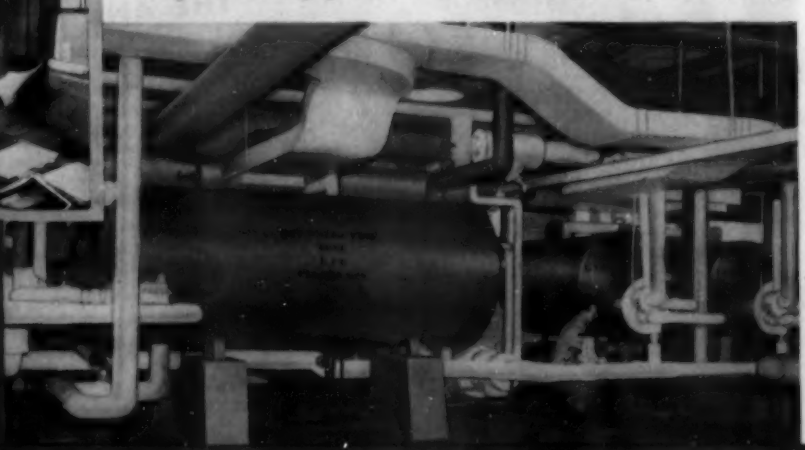
Paul L. Flemm, Building Engineer, is enthusiastic about p-k heater operation. "Heating water costs money. Trouble-free operation keeps costs down. We haven't had a single case of trouble with the p-k heaters . . . to date no cause to expect any. We . . . expect much better service than we would get from heaters made of ferrous metals."

For an unfailing source of pure, rust-free hot water—

LOOK FOR THE p-k Copper Lining.

Complete catalog gives all the facts. It's yours for the asking.





1198 Duncan Street, East Stroudsburg, Penn.

The **p-k** copper-lined storage heater consists of a complete copper heater built inside of a heavy steel shell. This combines the non-corrosive qualities of copper with the superior strength of steel. **p-k** copper-lined hot water storage heaters are recommended for installations requiring a completely dependable supply of rust-free hot water.

Circle 506 on Reply Card for more data

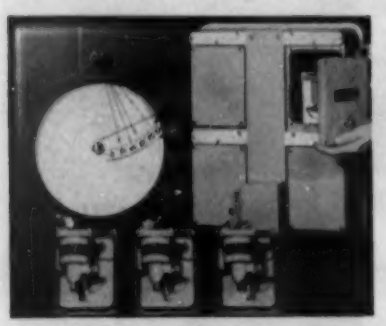
new equipment

—Starts on page 8

the field to meet specific job requirements. Unit can be used for sealing entry of thermometers, thermocouple wells, static pressure probes, and round rods or tubes of any type.

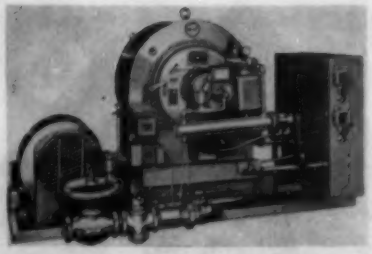
Packless proportioning pump provides accuracy of control

J18 The design of the Hills-McCanna-Meter is said to make possible a wide outlet flow range which is easily adjustable by light finger pressure while the pump is operating or stationary. Manufactured by Hills-McCanna Co., it is a proportioning pump with no packing and will meter quantities from 5cc to 6 gal per hr per ft, depending on material being handled. Standard units will develop pressures up to 2500 psig.



Plug-in receivers permit easy field adaptation

J19 Plug-in, precalibrated receivers in the Bailey Recorder make possible continuous, independent records of one to four pneumatic and electric transmissions in any combination, according to the manufacturer Bailey Meter Co. Receiver units may be added or interchanged, permitting easy field adaptation to new or revised metering and control applications. Fountain-type recording pens provide continous feed for one year without refilling.

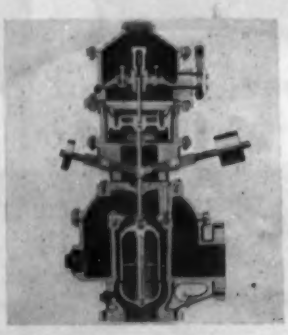


Packaged burner built to Scotch Marine specifications

J20 The Ray Oil Burner Co. announces the Forced Draft Packaged Burner built to specifications for Scotch Marine Type Boilers and other types of heat receivers designed for pressurized operation for industrial-commercial heating and power application. Burners are available to burn any grade of fuel oil from #2 to #6 bunker C and high or low pressure gas or as combination units burning either oil or gas. All components are completely wired, piped, and mounted on a structural steel base.

TO REQUEST ADDITIONAL DATA

Circle "key" numbers on Reply Card between pages 34/35 & 98/99. Your requests will be handled promptly.

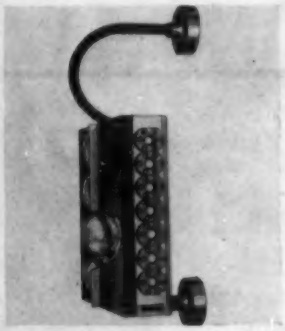


Controlled closing valve protects pipe lines

J21 Controlled closing valve Type CCAV, introduced by Simplex Valve & Meter Co., is for the protection of pipe lines against the effect of surge and build-up pressures or water hammer. It is furnished with a four inch diameter flanged inlet opening and is suitable for bolting directly to a four inch standard flanged fitting in the pipe line.

Reversing drum switch for ratings to two hp

J22 Federal Bulletin 905 Reversing Drum Switch, for all ratings up to two hp, is suitable for use with many types of electrically-driven equipment including conveyors, hoists, pumps, and processing equipment. Units are available in compact Type A (NEMA Type I) sheet steel enclosure with a U-shaped cover and feature double-break silver contacts for long wear. Federal Pacific Electric Co.

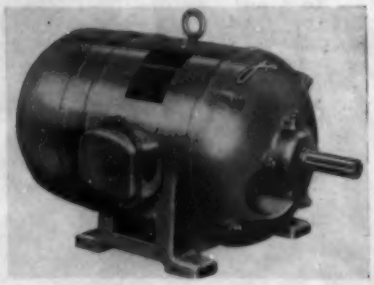


Bi-color gage is easily read

J23 Diamond Power Specialty Corp. announces the Multi-Port gage for water level indication in high pressure boilers (up to 3000 psi). Principal features are lower maintenance because of construction simplicity, greater pressure and thermo stability, light weight (58 lb including flanges), and excellent readability, since the ports stand out as brilliantly colored beacons— green for water and red for steam.

Color of mercury-vapor lamps improved—average life upped

J24 Deluxe Golden White, the latest color in mercury-vapor lamps to be developed by Westinghouse Lamp Div., extends applications of mercury lighting into the commercial field. The 400 w lamps will operate with standard 400 w ballasts and have an average life of 6000 hr. For best results fixtures such as those developed for the 1000 w fluorescent-mercury lamp should be used.



Brakemotor mounts in limited space

J25 Short overall length of the Integral Brakemotor announced by the Louis Allis Co. permits use of the units in many applications where they were formerly prohibited by space limitations. Units utilize disc brakes and are available in NEMA motor frame sizes from 203 to 326, furnish maximum continuous duty torque from 3 ft - lb in the smaller sizes to 50 ft- lb

BETZ • *A Great Name In Water Conditioning*

we're from Missouri...

. . . and for good reason!

Betz Water Conditioning Service is based on the policy that nothing is left to chance. There are no mere guesses or assumptions that conditions are satisfactory at a client's plant.

In addition to regular visits by Betz Engineers and daily water testing by plant personnel, we "double-check" results by means of more complete analyses in our own laboratories.

At regular intervals, water samples from important points throughout the plant system are secured by our engineers and forwarded to our modern laboratories. Here, experienced chemists analyze each sample until it literally breaks down and "admits the facts".

Such painstaking analyses often reveal conditions which may not be evident from plant control tests. It permits our Engineering Division to make corrective recommendations *well in advance*, thereby heading off any serious trouble which might develop. This, too, is *another* important part of Betz *completely-integrated* water conditioning service.

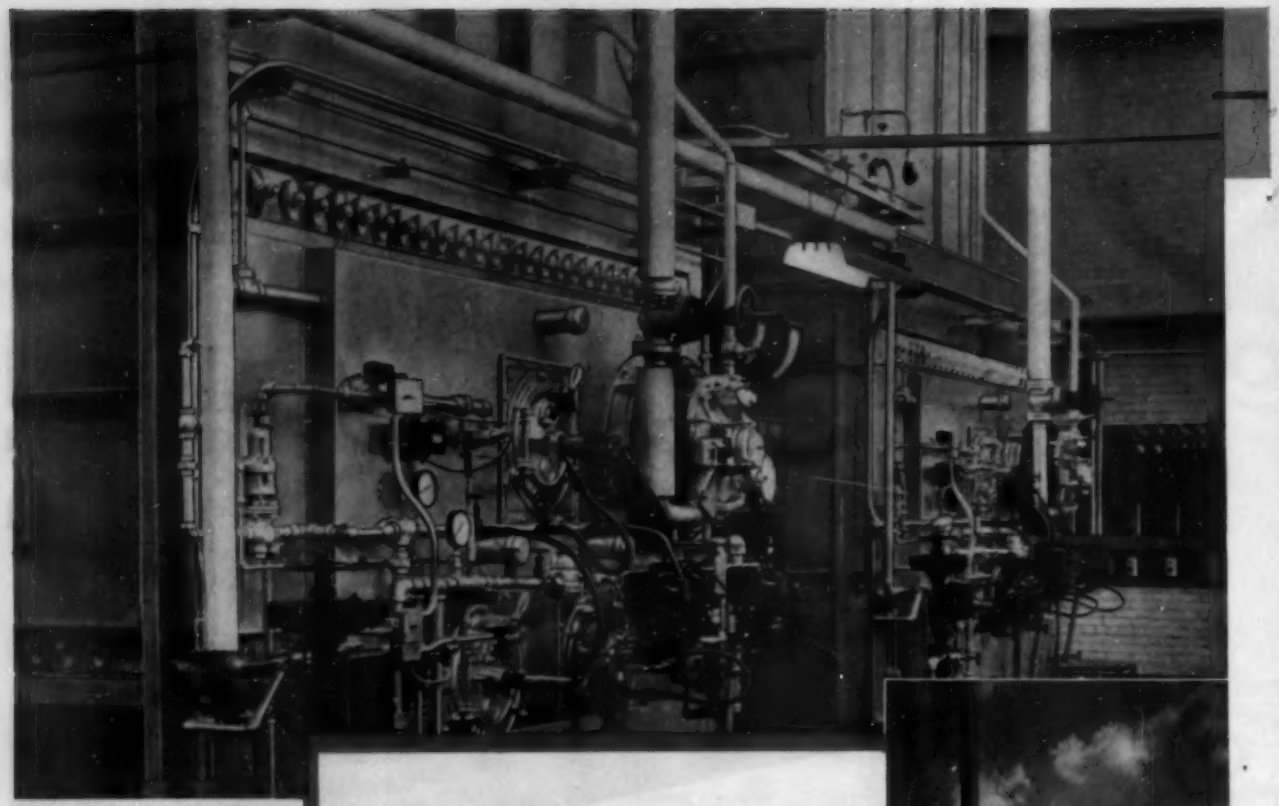
W. H. & L. D. BETZ, Gillingham & Worth Streets, Philadelphia 24, Pa.

In Canada: BETZ Laboratories Limited, Montreal 1.

BETZ

CONSULTANTS ON INDUSTRIAL WATER PROBLEMS

Circle 507 on Reply Card for more data



This installation of B&W Integral-Furnace Boilers at the Chicago plant of Wesson Oil Co. is producing "cheap" steam through efficient operation and with minimum maintenance and labor.

Sectional view of typical oil-fired B&W Integral-Furnace Boiler similar to units in service at Wesson Oil plant. Suitable for oil, gas, and coal firing the Integral-Furnace Boiler family is available in steam capacities to 350,000 lb per hr. Cost saving features covered in bulletins available on request.

G-633

on the record . . .

2 B&W Integral-Furnace Boilers at Wesson Oil's New Chicago Plant provide

PERFORMANCE with ECONOMY

Despite unusually severe operating conditions, with frequent and wide load swings at odd times and without warning, two B&W Integral-Furnace Boilers at this plant are providing steam efficiently and economically, to the complete satisfaction of company engineers. And performance such as this is being duplicated in plant after plant across the country—both new and old—where operational savings over a relatively few years are proving sufficient to cancel the initial investments.

Southern Cotton Oil Company—processor of the popular Wesson Oil and hydrogenated shortening—needed a fully-reliable steam supply for its new Chicago plant, with "push-button" operation wherever practical. To meet these requirements, they chose long-life, automatically controlled B&W Integral-Furnace Boilers. Oil-fired at present, they can also burn gas and may be converted readily to coal firing if conditions warrant. Each unit has a steam capacity of 40,000 lb per hr at pressures to 250 psi. They supply steam for year 'round processing and carry the additional load for heating during winter months.

An efficient system of automatic controls makes operation of these B&W Integral-Furnace Boilers quite simple. This emphasis on automatic operation has "paid off" at the new plant, which is producing steam with minimum maintenance and operating labor. These advantages are, of course, reflected in the plant's low overall steam cost.

Layout of the boilers and plant was under the direct supervision of Mr. L. C. Haskell, vice president of Southern Cotton Oil, working with the company's consulting engineers, The Austin Company, who designed and constructed the building. B&W erected the boilers, then ran complete operational tests before turning them over to Southern Cotton Oil Company as satisfactory, operating units. We shall be glad to discuss details of any unit in the B&W "family" of Integral-Furnace Boilers in terms of your steam requirements. The Babcock & Wilcox Company, Boiler Division, 161 East 42nd St., New York 17, N. Y.

Service-Proved

COST SAVING FEATURES

of B&W Integral-Furnace Boilers for Steam Requirements from 2900 to 350,000 Lb Per Hr.

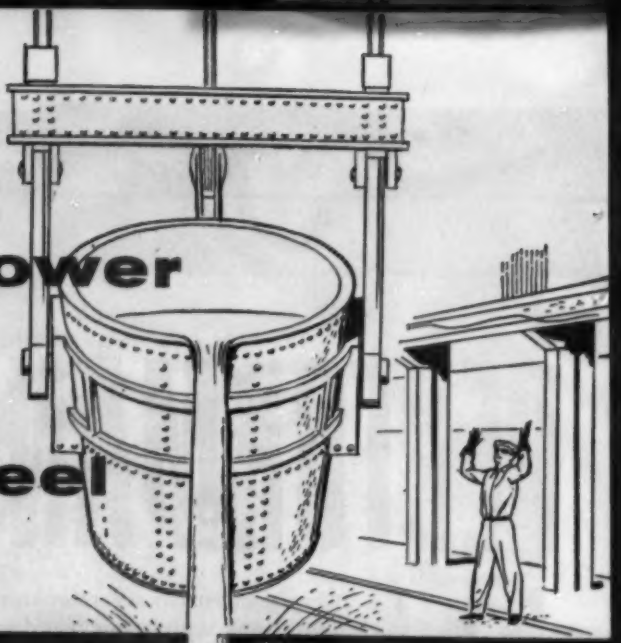
- Minimum floor space and headroom requirements
- High fuel economy
- Smokeless combustion
- Adaptable to all fuels and firing methods
- Economical fast steaming
- Water-cooled furnace
- Clean, dry steam at all ratings, even with high boiler-water concentration
- Quick response to wide and heavy load swings
- Easy to inspect and clean
- High availability with least attention

BABCOCK & WILCOX

B&W BOILER DIVISION

Circle 508 on Reply Card for more data

Pouring power into a giant of steel



Dramatic symbol of America's industrial might, U. S. Steel's big Fairless Works is completely new —a giant at birth! From foundations to furnaces, here is an outstanding example of industrial foresight and planning.

Among this huge mill's many impressive innovations is its planned system of power distribution. Substations, switchgear, and circuit breakers—channeling power throughout this giant of steel—are strategically located to provide maximum protection, control, and continuity of service.

Installation of *only the finest* of equipment has been a long tradition at U. S. Steel. Electrical distribution equipment—of fundamental importance—has to be rugged and dependable to fulfill these vital requirements.

at U.S. Steel's new FAIRLESS WORKS

kilowatts for a colossus feed
through switchgear and circuit breakers built by I-T-E

Some 70 modern indoor and outdoor I-T-E Unit Substations transform and distribute power throughout the mill. I-T-E Low-Voltage and Metal-Clad Switchgear, as well as Heavy-Duty I-T-E Circuit Breakers, guard the many critical steel processes.

From the start, I-T-E gave important engineering assistance in the preparation of specifications and in expediting *switchgear* orders for the Fairless Works. As a result of this close cooperation, power distribution equipment was on the ground *when needed* to fit right in with tight construction schedules.

Traditionally a supplier of U. S. Steel, I-T-E is proud of its place as a *major* contributor of quality power distribution equipment for the new Fairless Works.

AT FAIRLESS—

I-T-E Switchgear protects:

rolling mills	open hearths
coke ovens	maintenance shops
power house auxiliaries	office building
billet mills	car dumper
strip mill	ore dock
blast furnaces	oil bulk storage

For details, contact the I-T-E field office nearest you. Look in your classified directory under "Electric Equipment."

I-T-E METAL-CLAD SWITCHGEAR
installed in cold mill for 2400-volt distribution.

I-T-E LOW-VOLTAGE SWITCHGEAR
installed in sheet and tin mill for 480-volt distribution.

I-T-E HEAVY-DUTY CIRCUIT BREAKERS
Types MT and OH, used for DC sectionalizing in billet mill.

THE SYMBOL OF QUALITY SWITCHGEAR

I-T-E CIRCUIT BREAKER COMPANY

19TH AND HAMILTON STREETS, PHILADELPHIA 30, PA.

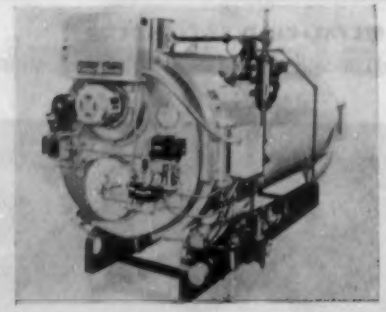
SWITCHGEAR PRODUCTS

Circle 509 on Reply Card for more data

new equipment

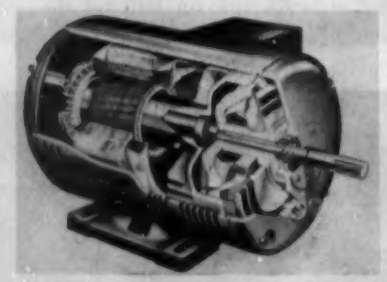
—Starts on page 8

in the largest sizes. External wear indicator eliminates cover removal and constant brake-lining inspection.



Larger models available

J26 Cleaver-Brooks Co. announces extension of its CB line of boilers to include units of 50, 60, 70, and 80 boiler hp capacity. Models are available to handle all grades of fuel oil, light distillate #2 to #6 or Bunker C and operate with remarkably low decibel ratings. Self-contained, the boilers burn gas or oil and can be converted from one fuel to another in less than a minute.

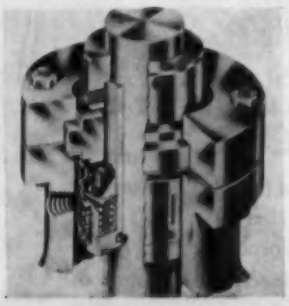


Power and speed control units for fractional hp drives

J27 Engineered to meet specific needs of fractional horsepower drives, the Fractional Horsepower Adjusto-Spede Drives are an integral combination of a-c constant speed induction motors, eddy-current couplings, and electronic speed controls. They have been used successfully for such diversified applications as drives for machine tools, conveyors, wire drawing equipment, welding machines, and metal and paper rewinds. Dynamatic Div. of Eaton Manufacturing Co.

Rectifier units eliminate need for pulleys

J28 Variable voltage rectifier units which are said to eliminate the need for variable speed pulleys, drives, and belts are announced by the American Rectifier Corp. in two types: with single-phase input from ½ to 3 hp; and three-phase input from ½ to 75 hp. Known as Variable Voltage Selenifiers, they are available for either 50 or 60 cycle input at any input voltage and dc output voltages of 115, 230, 250, or 440. A single knob controls the speeds.



Shaft seal is installed and removed easily

J29 Crane Packing Company's mechanical shaft seal Type 9 is mounted on a sleeve with an outside clamping ring. This permits quick installation or removal in practically all modern split-case pumps. The seal can be used to handle practically all corrosive liquids at temperatures to 500 F. Flexible sealing members are of Teflon and springs and metal parts can be furnished in metals to specification.

TO REQUEST ADDITIONAL DATA

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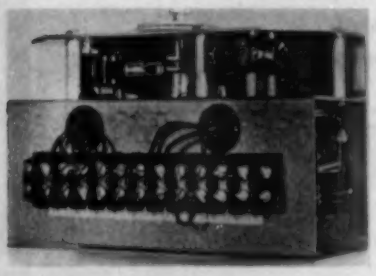
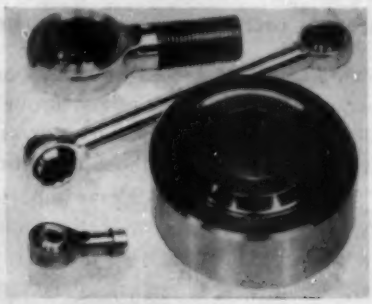


Timing device provides two separate circuits

J30 Of particular value in industrial plant operations of the automatic factory type will be the motor driven timing device introduced by Automatic Controls Co. and known as the Motorelay. It incorporates two separate, independent timing circuits and is normally field adjustable over a range of 20-165 sec for both the "start" and "stop" time delay. It is applicable to any pumping-in or pumping-out situation, particularly where a considerable amount of backspin protection is necessary, as in the case of a deepwell.

Underwriters' approves seal-less centrifugal pump

J31 Chempump Corporation's sealless, leak-proof centrifugal pumps are now listed by Underwriters' Laboratories for explosion proof operation with hazardous liquids and in hazardous atmospheres. Units are available for pumping solvents and light hydrocarbons at capacities to 180 gpm and at heads to 90 ft for Class 1 Group D protection in a wide variety of construction materials.



Spherical bearing design allows heavier loads

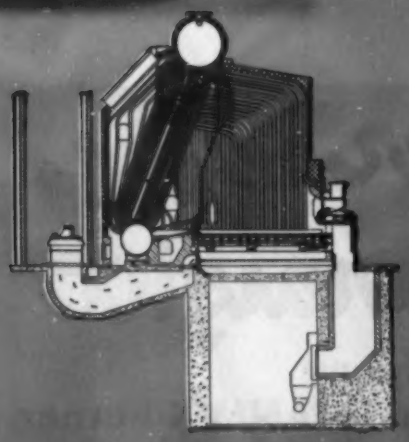
J32 You can reduce size and weight of mounting installations by using the new, smaller Delron bearing which has the same load carrying ability as larger bearings of other designs. The Delron Co., Inc. is now manufacturing the spherical bearing in many configurations including rod ends and in sizes up to No. 16. They are especially adaptable where severe operating conditions require special materials, high temperature resistance, and heavy load carrying ability.

Pipe vise with stand has built-in tray

J33 Made with an efficient new built-in folding tool tray that eliminates all loose parts, the Ridgid 40A Tristand Pipe Vise has been announced by The Ridge Tool Co. It is equipped with three pipe benders, ceiling brace screw, pipe rest, and tool hanging slots.

Rubber hose conducts concentrated acid safely

J34 Republic Rubber Div. of Lee Rubber & Tire Corp. has developed a hose tube compound that makes it possible to safely conduct



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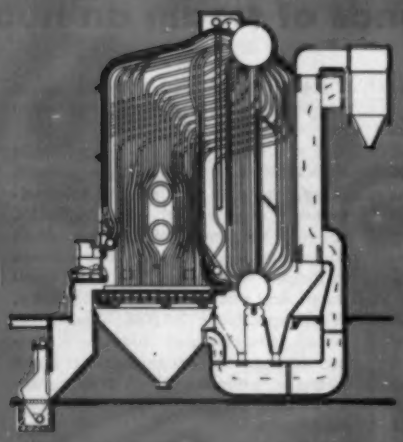

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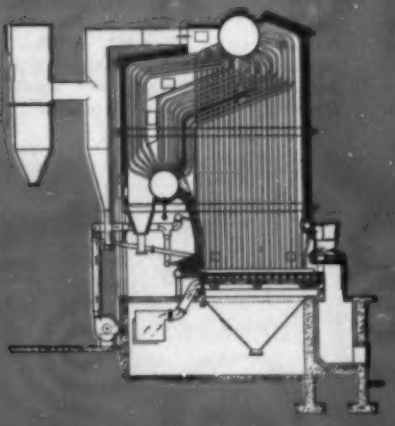

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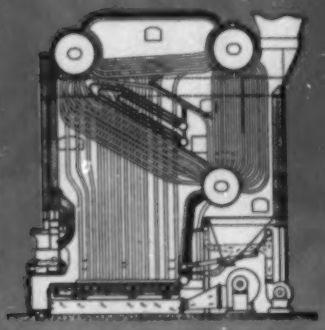


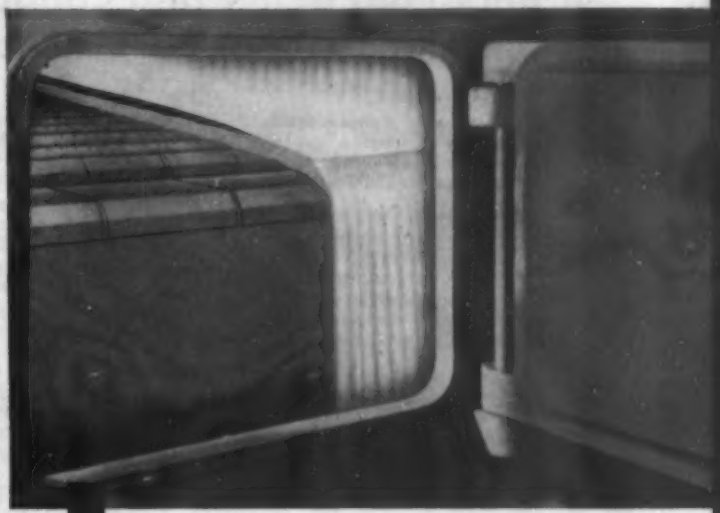
4.

EASILY APPLIED TO

new or existing boilers

Detroit RotoStoker type C-C

(continuous cleaning)



Popular because the reciprocating grate continuously discharges the ash, for easy removal through doors in the front at floor level or by conveyor.

May be applied to new or existing boilers of all types with low construction expense.

Smokeless operation assured through wide load range.

Detroit RotoStoker Type C-C efficiently burns Bituminous Coals and Lignite without special preparation.

Get full information on the Detroit RotoStoker Type C-C . . . Write for Bulletin 800. No obligation.

1. **Detroit RotoStoker Type C-C with Babcock & Wilcox Boiler—35,000 lbs. per hr.**
2. **Detroit RotoStoker Type C-C with Union Boiler—46,000 lbs. per hr.**
3. **Detroit RotoStoker Type C-C with Springfield Boiler —50,000 lbs. per hr.**
4. **Detroit RotoStoker Type C-C with Wickes Boiler—40,000 lbs. per hr.**

DETROIT ROTOSTOKER TYPE C-C

DETROIT STOKER COMPANY

GENERAL MOTORS BLDG., DETROIT 2, MICH. • Works at Monroe, Mich. • District Offices in Principal Cities

Circle 510 on Reply Card for more data

Boiler-Burner Team Wins Seven Straight

Phillips Chemical Company orders Vogt boiler and Coppus-Dennis FANMIX burner combinations to make 1¾ million pounds of steam an hour

When a customer praises a product, that's fine. But when a customer *continually re-orders*, that's conclusive proof of user-satisfaction.

Phillips Chemical Company, Borger, Texas — producer of synthetic rubber — first installed Henry Vogt boilers with FANMIX burners back in 1943. As plant production increased, Phillips again purchased the same equipment — in 1946, and again in 1951.

Today, a total of 7 Vogt boilers equipped with Coppus-Dennis FANMIX burners provide 1,750,000 lbs. steam each hour for the production of synthetic rubber. The boilers are designed for 250,000 lbs. steam peak operation but have been operated as high as 275,000 lbs. per hour. Their performance is typical of the efficiency of boilers equipped with Coppus-Dennis FANMIX burners.

FANMIX · Better Combustion · Better Efficiency · Higher Ratings

All Coppus-Dennis FANMIX burners — for gas as well as combination gas-oil — have the exclusive FANMIX action. Their *revolving orifices* give violent mechanical mixing and agitation of gas and air, therefore causing instantaneous and complete combustion with *minimum excess air* (5% excess air is not unusual).

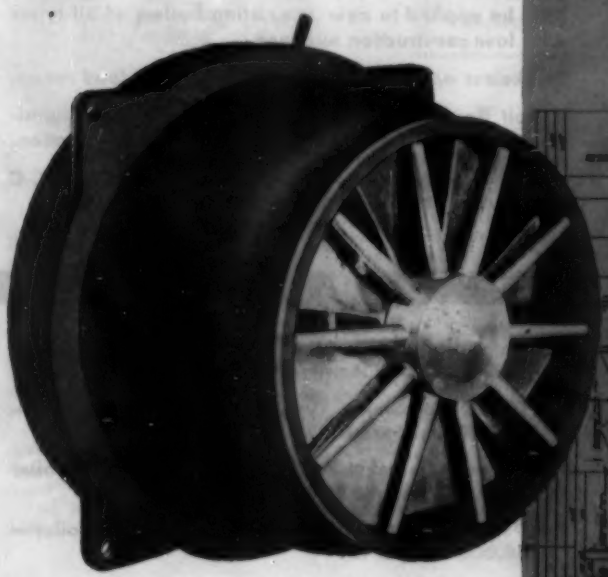
Because of this exclusive FANMIX action, furnace space is not required for mixing and *higher boiler ratings* are thus easily obtained. The burners also have a shorter flame than any other burner and will not cause flame impingement.

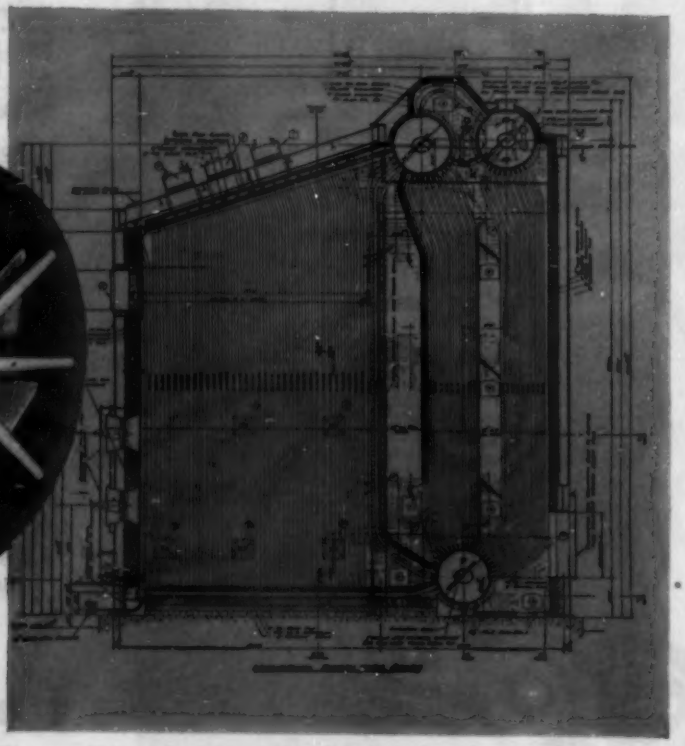
What's more, by incorporating a *fan* as an integral unit, FANMIX burners have *no draft loss* across the burner. As a result, increased ratings are possible regardless of draft conditions.

FANMIX action, with its quick completion of combustion, gives *lower* exit temperatures.

If you are not using Coppus-Dennis FANMIX burners in your present boiler, why not plan now to take advantage of the exclusive FANMIX action? You need no forced draft equipment, increase in stack or increase in furnace volume for FANMIX operation. And you get increased capacity. When specifying FANMIX on *new* boilers, you can plan on reduced combustion space, higher ratings, less stack height or reduced induced draft capacity — and, of course, *no* forced draft equipment.

For further information, mail coupon today. Sales offices in *Thomas' Register*. Other "Blue Ribbon" Products in *Chemical Engineering Catalog, Refinery Catalog, Best's Safety Directory* and *Mining Catalogs*.





JET REACTION is utilized to rotate fan which is integral part of burner. Ideal mixture for fast, complete combustion and peak efficiency is caused by automatically proportioned high velocity air passing at right angles through fuel.

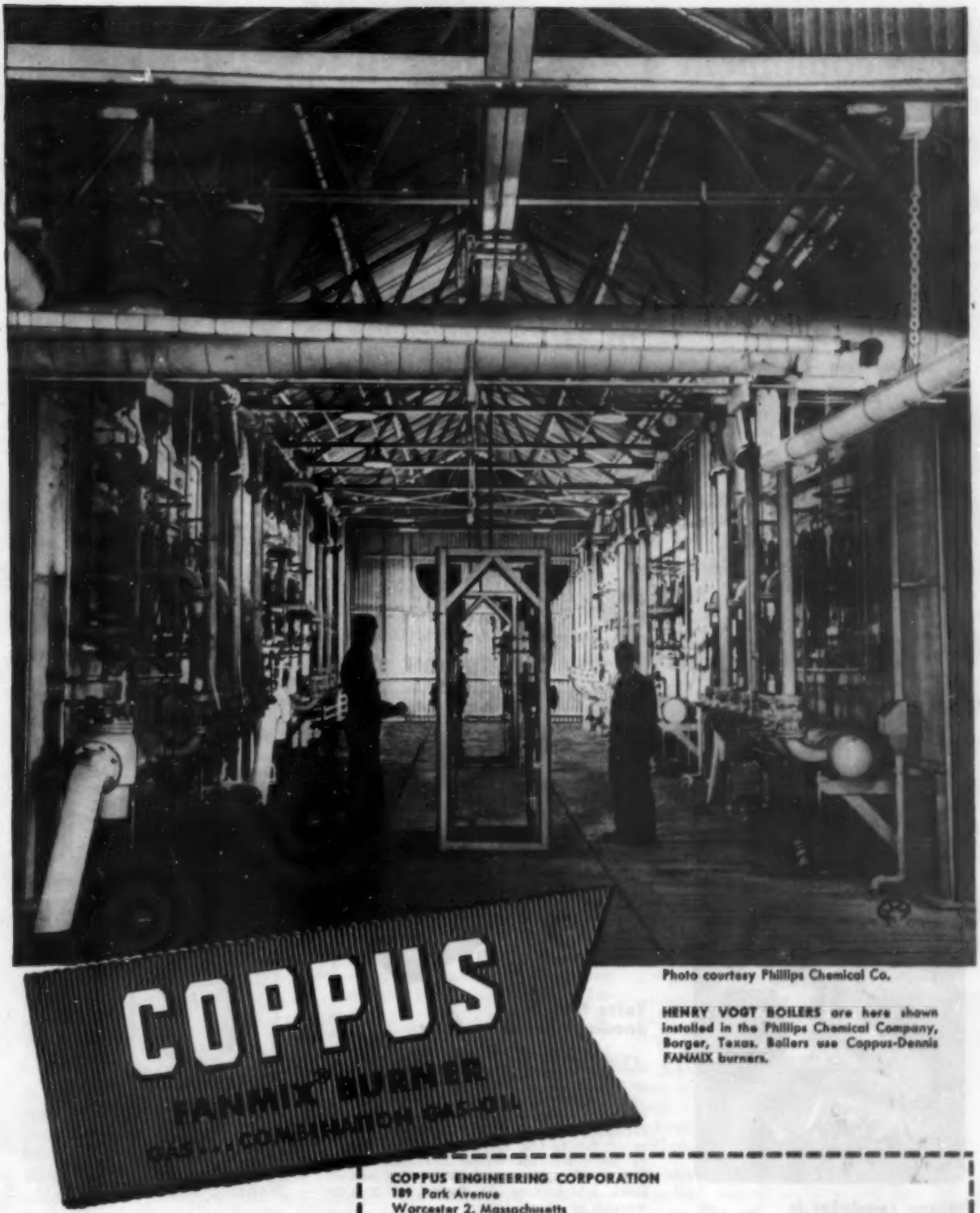


Photo courtesy Phillips Chemical Co.

HENRY VOGT BOILERS are here shown installed in the Phillips Chemical Company, Borger, Texas. Boilers use Coppus-Dennis FANMIX burners.

SEND COUPON for further information. Coppus engineers FANMIX burners to your individual requirements.

PLEASE ATTACH THIS COUPON TO YOUR COMPANY LETTERHEAD

COPPUS ENGINEERING CORPORATION
189 Park Avenue
Worcester 2, Massachusetts

Please send complete data on Coppus-Dennis FANMIX Burners. I'm particularly interested in ☐ gas ☐ combination gas-oil.

Name..... Title.....

Company.....

Address.....

City..... Zone..... State.....

Circle 511 on Reply Card for more data

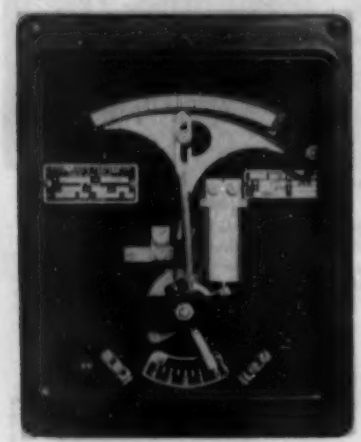
new equipment

—Starts on page 8

concentrated acid solutions through rubber hose. This acid hose has been used successfully for sulphuric acid at 66 deg baume, 70 percent hydrofluoric acid, concentrated chromic acid, and concentrated nitric acid.

Dust collectors handle heavy loads efficiently

J35 Model R Aeroturn dust collectors, incorporating reverse-air-jet dust filtering, have been designed to increase dust collector efficiency particularly in handling heavy dust loads. According to the manufacturer, Turner & Haws Engineering Co., Inc., the unit's cylindrical housing and continuous cleaning action make economically possible dust collecting in pneumatic conveying systems operating under high pressure-vacuum conditions.



Voltage regulator is factory sealed

J36 Generator voltage regulator, Universal Model JSG 1/1, is factory-sealed and all connections, including jumpers, are made to external terminals. Unit will regulate voltage of any standard generator rated from 25 to 250 kva, 50 or 60 cycle, 1200 to 1800 rpm with a rated exciter voltage of 80 to 125 v. Brown Boveri Corp.

Automatic carrier designed for small batch transfer

J37 For intermittent transfer of bulk materials between a single loading point and any number of discharge stations, American MonoRail Co. announces a carrier consisting of standard twin-hook electric hoist for raising and lowering a special bucket equipped with casters for manual positioning on the floor. Electric controls for automatic dispatch, station selection, as well as manual operation, are included on the unit.

TO REQUEST ADDITIONAL DATA

Circle "key" numbers on Reply Card between pages 34/35 & 98/99. Your requests will be handled promptly.

Valve features anodized aluminum body

J38 Designed to meter flow in one direction and allow free flow in the opposite direction, model 3620 valve features an anodized aluminum body and a nylon poppet. The manufacturer, Rivett Lathe & Grinder Inc., recommends the valve for 150 psi air or 300 psi oil or water. Corrosion-resistant adjusting screw has slotted hex head which may be turned with a wrench or screw driver.

Clutch coupling handles all types of misalignment

J39 The Twiflex Automatic Centrifugal Clutch Coupling, said to have exceptional ability to handle all types of misalignment, is made in a large number of sizes and several different types. It improves starting conditions and provides smooth acceleration on drives for high inertia equipment and prevents excessive torque transmission during starting of machinery. The Hilliard Corp.

Leak detector is portable and time-saving

J40 Dragnet Leak Detector, a time-saving instrument for detecting and locating leaks in all types of pressure piping systems, is announced by Universal Controls Corp. Unit is portable and consists of test pump, air storage tank, pressure gage, transparent bubble bowl with non-freezing fluid, and flexible hose for connecting to piping under test.

Color-corrected mercury vapor lamp of medium wattage

J41 Particularly suitable for commercial and industrial installations where lamps must be mounted at heights under 20 ft, the CC-H5, 250 w color-corrected mercury vapor lamp, announced by Sylvania Electric Products, Inc. is said to give several times the life and double the output for the same wattage when compared with incandescent light sources.

Enclosure designed for dust laden atmospheres

J42 Patterned after JIC requirements, the I-T-E Circuit Breaker Company's NEMA 12 enclosure is said to insure dependable circuit breaker operation in atmospheres containing excessive particles of lint, dirt, sawdust, and other foreign matter. They are available with E, F, J,

Cleaver-Brooks gives you—
ECONOMY
FROM EVERY ANGLE

Cleaver-Brooks boilers are performance engineered for installation in schools, industrial plants, institutions, etc.

Use this guide to plan present and future boiler installations

Here are basic reasons why Cleaver-Brooks self-contained boilers SAVE money wherever installed. Remember these advantages when expanding your present plant or replacing obsolete boilers. For complete details, write for catalog AD-100, Cleaver-Brooks Co., Dept. [illegible] E. Keefe Avenue, Milwaukee 12, Wisconsin, U.S.A. — *Cable address: CLEBRO — Milwaukee — all codes.*

● **SAVES FUEL** — greatest efficiency and fuel economy through high-heat transfer of four-pass, forced draft boiler design.

● **SAVES SPACE** — boilers are compactly self-contained. Use less boiler room area. Fit into low headroom locations.

● **SAVES SERVICE** — factory assembled with trouble-free, quality components. Tested and backed by Cleaver-Brooks' one-source responsibility. ASME code constructed.

● **SAVES MAINTENANCE** — oil, gas or combination oil/gas firing eliminates bulky fuel handling. Designed for easy cleaning and inspection.

● **SAVES EXPENSE OF SPECIAL EQUIPMENT** — boilers available for hot water or steam service . . . heating or processing applications.

● **SAVES INSTALLATION COSTS** — no special foundation needed. Set boiler on existing concrete floor. Simple, roof-high vent eliminates costly smoke stack. Service connections conveniently located.

● **SAVES THRU FUEL FLEXIBILITY** — uses most economical and available fuel in your area. Exclusive burner permits 10-second gas/oil interchange.

● **SAVES BY QUICK STEAMING** — meets fluctuating steam loads automatically. Electronic controls start and stop burner. Safety controls assure 100% protection.

● **SAVES MANPOWER** — fully automatic operation. All controls easily accessible and all normal maintenance can be done by men without special training.

● **SAVES PLANNING TIME** — standard design in 15 to 500 hp; 15 to 250 psi gives you custom planning for single or multiple units.

IT PAYS TO PLAN FROM ALL ANGLES TO GET GREATEST BOILER ECONOMY — PLAN WITH CLEAVER-BROOKS — WRITE FOR DATA TODAY

"It's NEW — get the facts on the CB boiler — write today!"

Cleaver Brooks

ORIGINATORS OF THE SELF-CONTAINED BOILER

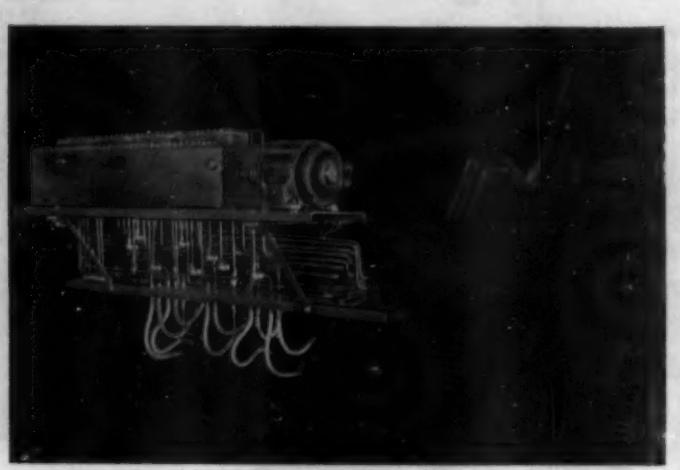
Circle 512 on Reply Card for more data

MANZEL

FORCE FEED LUBRICATORS

COST LESS...

than doing without them!



Pressure Application — Exact Amounts — Accurately Timed

* Manzel Force Feed Lubricators quickly save their cost by preventing breakdowns due to faulty or forgotten lubrication — by reducing the quantity of lubricants used — and by eliminating the labor of hand oiling. They keep vital parts properly lubricated for uninterrupted production efficiency round the clock.

You can have Manzel Force Feed Lubricators installed on present equipment or engineered into new machinery. Write for information.

Manzel

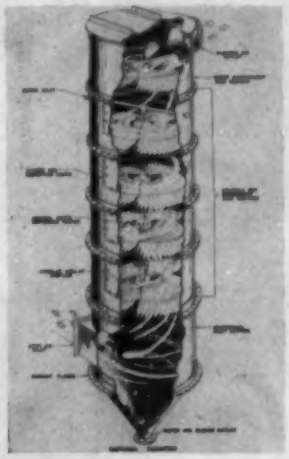
DIVISION OF FRONTIER INDUSTRIES, Inc.
320 BABCOCK STREET, BUFFALO 10, NEW YORK

Circle 513 on Reply Card for more Data

new equipment

—Starts on page 8

and L frame circuit breakers in ratings from 15 to 600 amp, 125 to 600 v ac, 125 to 250 v dc. Small Air Circuit Breaker Div.

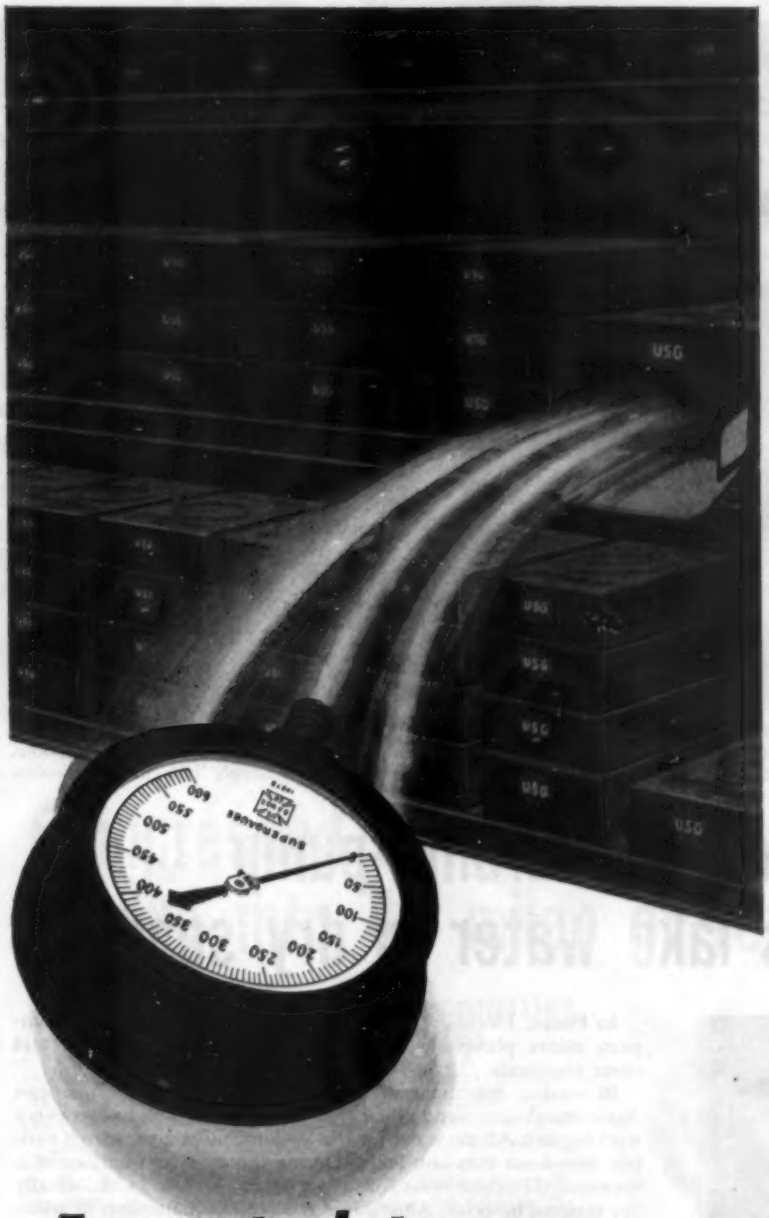


Wet dust collector handles problem dusts safely

J43 For dust control problems that cannot be solved by the use of cloth type collectors—high temperature or moisture, explosive or combustible dusts, corrosive, highly abrasive or obnoxious dust, and combinations of these problems—Pangborn Corp. has developed the Type CW-1 centrifugal wet dust collector. After clarification in settling tanks, the water may be recirculated since no spray nozzles are used—the water inlet being an open end pipe.

Motorized valve operator serves small valves

J44 LimiTorque Valve Controls, manufactured by Philadelphia Gear Works, answer the need for a motorized valve operator for small valves ranging from 1½ to 8 in. part diameters. Known as the SMA-00 and SMA-000 models, the operators can be controlled electrically from any push button station and are equipped with a



From stock to you... Fast!

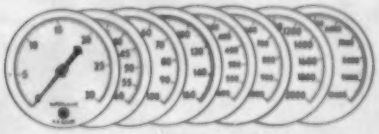
In addition to the well stocked shelves of your USG Distributor, USG stocks over 200,000 gauges in a variety of types, sizes and ranges to meet every industry need.

Your USG Distributor has on his shelves, or can get for you fast, any quantity of gauges you want for any application. See your USG Distributor for all your gauge requirements.

MANY USG STOCK GAUGES ARE "SPECIALS" WITH OTHER MAKERS

For over 50 years USG has been designing and producing gauges for more original equipment manufacturers than any other instrument company in the world.

Many of USG's "special" designs have become standard stock items in the industry. Many others that are "standard stock" at USG require expensive special production with other instrument manufacturers.



To meet the special gauge requirements of industry economically, USG maintains—in addition to its huge stocks of standard gauges—the world's largest inventory of gauge components to meet any pressure sensing and actuating need.

To assure higher quality gauges with enduring accuracy, USG maintains the most rigid quality control system in the industry. This rigid inspection system is supported by a Standards Laboratory with masters measuring from low vacuums to super pressures.

USG's wide experience in all pressure sensing and actuating applications, plus its economically integrated facilities for large volume, quality controlled production, permit a better gauge—with enduring accuracy—*in every competitive price class.*

UNITED STATES GAUGE

Gauge Headquarters

FOR OVER 50 YEARS

United States Gauge, Division American Machine and Metals, Inc., Sellersville, Penna.

UNITED STATES GAUGE

Circle 514 on Reply Card for more data

LOW INITIAL COST and widespread reputation for dependability were the big reasons why The American Agricultural Chemical Company selected a Worthington vertical turbine pump. They use it to maintain proper storage level of their water supply lake in dry seasons.

Worthington vertical turbine pump supplements lake water in dry season

PHOSPHATE ROCK IS WASHED DOWN on flat screens to underwater trommels at American Agricultural. The Worthington vertical turbine pump ensures an adequate supply of water during the dry periods when the impounded rain water level in their supply lake gets low.

In Pierce, Florida, The American Agricultural Chemical Company mines phosphate rock for processing into fertilizers and other chemicals.

In washer operations at their South Pierce Mine, American Agricultural uses over 2,500,000 gallons of recirculated water every working day. All the water for this vast operation comes from various mined-out cuts and lakes. During the rainy season, water is impounded in these areas for use in the dry season. In abnormally dry seasons, however, American Agricultural supplements its water storage by using a modern Worthington vertical turbine pump.

Like American Agricultural, more and more industrial plants are turning to Worthington vertical turbine pumps as the most economical means of supplying water. Users everywhere praise the low maintenance and power costs of these dependable pumps.

Write today for our Vertical Turbine Pump Bulletin W-450-B-39. Worthington Corporation, Vertical Turbine Pump Division, Harrison, New Jersey.

4-32

WORTHINGTON

THE WORLD'S BROADEST LINE ASSURES YOU THE RIGHT PUMP FOR EVERY JOB

CENTRIFUGAL • ROTARY • STEAM • POWER • VERTICAL TURBINE

CONSERVE GROUND WATER—IT IS A VALUABLE RESOURCE

Circle 515 on Reply Card for more data

WORTHINGTON DC-2 COMPRESSORS are installed in the Libbey-Owens-Ford Glass Company's Fiber-Glass plant in Parkersburg, West Virginia. They have five-step variable capacity controls enabling them to operate with a minimum power consumption.

Compressed air helps turn a single glass marble into 42 miles of textile filament!

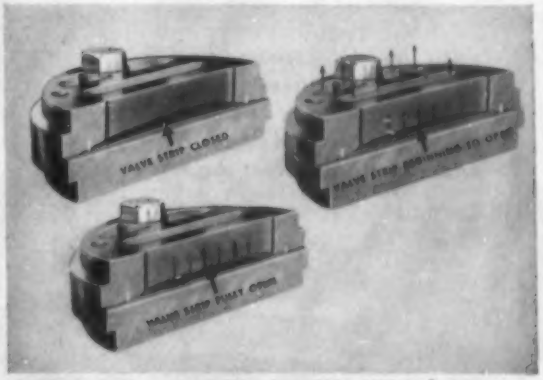
Libbey-Owens-Ford uses Worthington compressors in the manufacture of fiber glass

Daily, more than 40 million miles of filament, gathered into strands of fiber glass, twisted into yarns, and woven into industrial cloth, tape and other textile forms, are produced at the Libbey-Owens-Ford plant at Parkersburg, West Virginia.

The fiber glass filament is made by melting specially prepared glass marbles in small furnaces and drawing the glass through the minute apertures of a "bushing". Humidity is important in handling these continuous fibers of glass and compressed air is used to maintain accurate man-made weather. Compressed air is actually used in 22 important operations in making fiber glass in this ultra-modern factory.

Three Worthington DC-2 compressors, each with five-step capacity control, supply the air pressure required in these many delicate tasks.

Whatever your requirements for compressed air, Worthington builds compressors to meet them. Write us about your compressor problems. Worthington Corporation, Compressor Division, Section K.4.1, Buffalo, N.Y.



WORTHINGTON'S EXCLUSIVE FEATHER* VALVE lowers compressor fuel consumption. A series of thin flexible strips of ribbon steel lift and flex uniformly as shown. This lightest, tightest, most durable valve ever made is standard on all Worthington compressors. *Reg.U.S.Pat.Off.

K.4.1

WORTHINGTON

Only Worthington Compressors give you Feather Valve Performance

T-types • Balanced Angle • Horizontal • Portable • Radial • Gas Engine Compressors

Circle 516 on Reply Card for more data

Wing
REVOLVING
UNIT HEATERS
The Moving Airstream Touches the Worker for only a few Seconds at a Time
NO SICKENING HOT BLAST!
THAT is the big difference between most unit heaters and the WING Revolving Heater. The soft airstream from the slowly revolving discharge outlets creates a warm, gentle, yet live sensation of comfortable well-being that is without equal for keeping workers contented and productive.
. . And in the Summer time with the steam turned off and the fans on, these same revolving discharge outlets will create a pleasing, cooling effect on the hottest days.
Write for Bulletin HR-6
Wing
75th Anniversary
L. J. Wing Mfg. Co.
139 Vreeland Mills Road, Linden, N. J.
Factories: Linden, N.J. & Montreal, Canada
In Europe: Etab. Wanson, Brussels, Belgium
UNIT HEATERS
FANS
BLOWERS
DRAFT INDUCERS
TURBINES
Circle 517 on Reply Card for more data

new equipment

—Starts on page 8

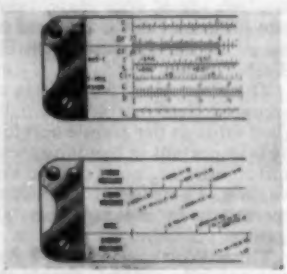
hand wheel for use in case of power failure. Literature is available.

Valves are designed for higher pressures and temperatures

J45 Solenoid valves of stainless steel for extremely high pressures are available from Atkomatic Valve Co. in sizes ⅛, ¾, and 1½ in. pipe sizes. The ⅛ and ¾ in. sizes are rated to 2500 psi and the 1½ in. size to 3000 psi. Piston rings compensate for expansion under heat and eliminate sticking.

TO REQUEST ADDITIONAL DATA

Circle "key" numbers on Reply Card between pages 34/35 & 98/99. Your requests will be handled promptly.

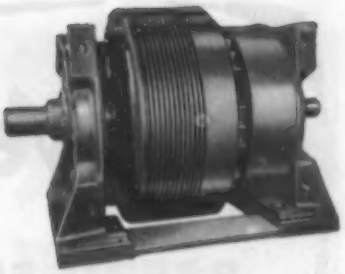


Slide rule converts without computation

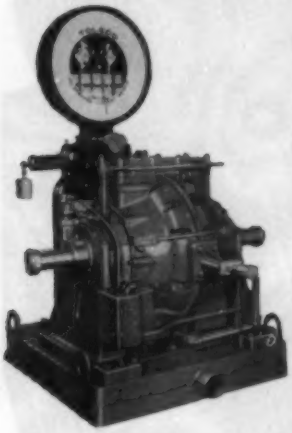
J46 Replacing the conventional Table of Equivalents is a new Conversion Slide Rule bearing 64 linear, liquid, energy, and miscellaneous factors on one side plus a complete Trig Scale arrangement on the reverse side consisting of A, K, DF-CF, T, S, CI, C-D and L scales. It is being introduced by Pickett & Eckel, Inc. By "positioning" a conversion mark opposite an index mark, any conversion is automatically set and read on one of the scales without moving the slider and without further computation.

AIR COOLED COUPLINGS

AJUSTO-SPEDE MOTORS



PRESS DRIVES



DYNAMOMETERS

AIR COOLED BRAKES

LIQUID COOLED COUPLINGS

Our new booklet, "Bulletin GB2," describes and illustrates the basic Dynamatic Eddy-Current units, including the new Stationary Field Coupling. If you are interested in modern speed control, write for your copy.

LIQUID COOLED BRAKES

Speed Control Problems?

One of these Dynamatic Units may be the solution

Dynamatic Eddy-Current Couplings, brakes, clutches, Dynamometers, and Ajusto-Spede motors, in use today in practically every basic industry—in both plant equipment and end products—are proving the ideal solution to difficult speed control and testing problems. Advantages include rapid response, infinitely adjustable speed control, wide speed range, quiet operation, high full-load efficiency, low maintenance cost, adjustable speed from an AC power source. Write for your copy of the new Dynamatic Bulletin GB2 today.

DYNAMATIC®

DIVISION EATON MANUFACTURING COMPANY

KENOSHA, WISCONSIN • General Offices: Cleveland, Ohio

Circle 518 on Reply Card for more data

$ave Power
and
REFRIGERATION COST

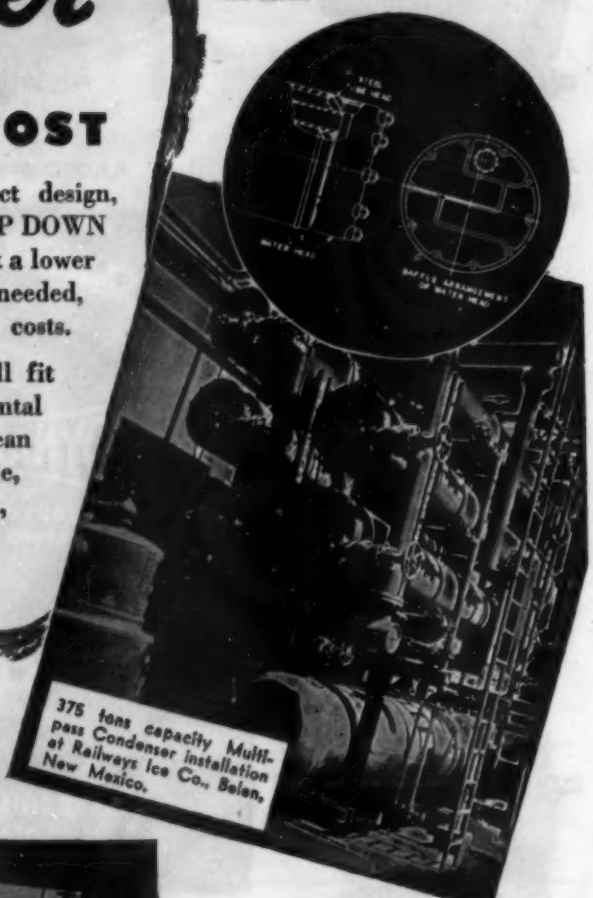
Vogt Condensers, because of their correct design, STEP UP the rate of heat transfer and STEP DOWN head pressures. With the liquid delivered at a lower temperature, smaller compressor capacity is needed, saving in original as well as operating costs.

One of the two basic types illustrated will fit your operations exactly. Install Horizontal Multipass (closed type) for use with clean waters. Where the water is hard, forms scale, contains mud or promotes fungus growth, Vertical Single Pass (film type) which can be cleaned in operation, are recommended.

Horizontal Multipass Condensers

(Closed Type)

Water circulated in tubes traverses the length of the unit a number of times as determined by baffles in the heads.

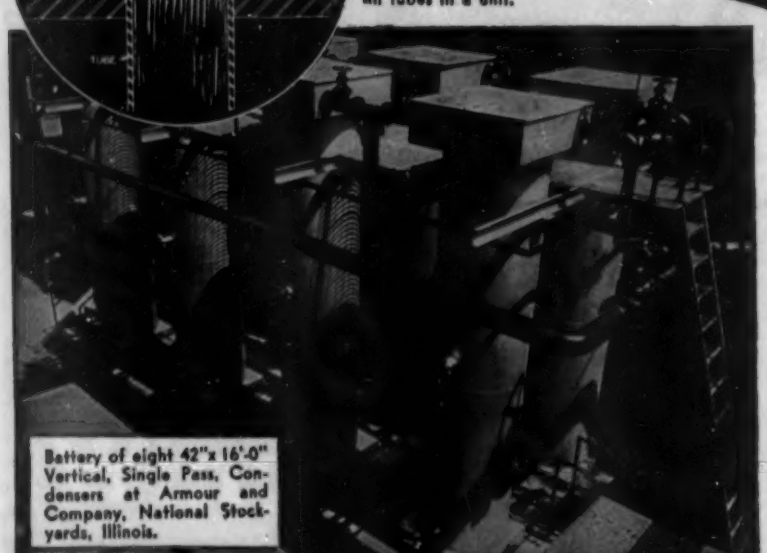


375 tons capacity Multipass Condenser installation at Railways Ice Co., Belen, New Mexico.

Vertical Single Pass Condensers

(Film Type)

Patented ferrules give equal distribution of water to and over the surfaces of all tubes in a unit.



Battery of eight 42"x 16'-0" Vertical, Single Pass, Condensers at Armour and Company, National Stockyards, Illinois.

HORIZONTAL and VERTICAL TYPES SHELL and TUBE CONDENSERS For Every Service

Write For Bulletin RC-2

HENRY VOGT MACHINE COMPANY

INCORPORATED

1000 W. ORMSBY ST., LOUISVILLE 10, KY., U.S.A.

Branch Offices: NEW YORK, CHICAGO, CLEVELAND, DALLAS, PHILADELPHIA, ST. LOUIS, CHARLESTON, W. VA.

Vogt REFRIGERATION CONDENSERS

Circle 519 on Reply Card for more data

Why does this packing outwear others in cold liquid service?
Because J-M NAVALON contains and retains more lubricant!
Johns-Manville
NAVALON PACKING

...and NAVALON® is made of Ramie, nature's strongest fibre

J-M Navalon gives more value because it outwears other high quality packings in cold liquid service. Made by an exclusive process, it contains more lubricant to start with and retains more lubricant in service . . . resulting in less wear on equipment and longer packing life. Navalon has other unique features, too. It resists rot and mildew . . . its strength actually increases when wet . . . the result: fewer shutdowns for repacking.

That's why Navalon is widely used to seal against fresh or salt water, brine, cold oils . . . and many other cold liquids. It has an excellent record of service on pumps, elevators, accumulators, reciprocating rods and plungers, stern tubes and rudder posts of ships. Available in full range of sizes, in styles 190 and 245 for industrial use, style 175 for marine use.

Your J-M Packing Distributor carries complete stocks of J-M Navalon and other high quality Johns-Manville Packings. He can help you choose the right one for your application. Call him for complete information or address Johns-Manville, Box 60, N.Y. 16, N.Y. In Canada, 199 Bay St., Toronto 1, Ont.

JM PRODUCTS

Johns-Manville PACKINGS & GASKETS

Circle 520 on Reply Card for more data

Buy Guaranteed Efficiency in your Dust Collection...

Consult Norblo

Guaranteed efficiency of fume and dust collection systems engineered and built by Norblo is obtainable because Norblo Equipment includes automatic bag type, improved centrifugal, and hydraulic types. Your operations may require one of these types — or all three! Norblo can tell you — will engineer the necessary combination to handle your dust and fume collection at most economical cost. More than 40 years experience serving many industries. State your problem so we can send literature on equipment applicable to your needs.

Norblo Portable Dust Collecting Units solve many localized problems.

Ask for Bulletin 163-5

The Northern Blower Company

Engineered Dust Collection Systems for All Industries

6422 Barberton Ave. OLympic 1-1300 Cleveland 2, Ohio

Circle 521 on Reply Card for more data

letters

. . . from readers

Cathodic Protection

Gentlemen:

In your June, 1954 issue of INDUSTRY AND POWER you published an article entitled "Cathodic Protection for Industrial Plants" by Mr. J. H. Hirshfeld, Vice President of the Hinchman Corp.

I would like to contact Mr. Hirshfeld concerning this article and cannot find the Hinchman Corp. listed in Thomas' Registry. Would you please let me have his address so that I may write to him direct?

J. T. Cataldo
Assistant General Manager
International Rectifier Corp.
El Segundo, California

—Mr. Hirshfeld's address is Hinchman Corp., Francis Palms Bldg., Detroit 1, Michigan.

Dear Sir:

I have just finished reading an interesting article in the June issue of INDUSTRY AND POWER entitled "Cathodic Protection for Industrial Plants."

Would you please advise me where I may obtain more information pertaining to this subject.

B. A. Crosson
Plant Engineer
Brown University
Providence, R. I.

—Mr. Crosson was referred to the author and to the National Association of Corrosion Engineers, 1061 M & M Bldg., Houston, Texas.

Average Cost

Gentlemen:

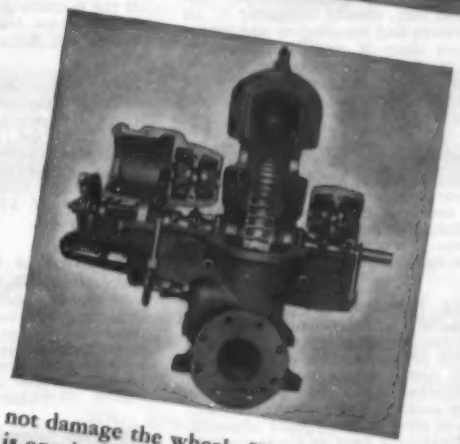
I was thumbing through some of your past issues of INDUSTRY AND POWER and came upon an article which is of interest to me. It appeared in your December 1952 issue and was titled "Air Leaks In Production Lines Cost Money." It stated that a 3/8 in. opening caused an air loss of 6,671,890 cu ft per month at a cost of $467.03. I would appreciate it if you could show me a break down on just how you arrived at this cost.

W. E. Kollenkark
Chief Electrician
Harbison-Walker Refractories

—This figure is based upon an air pressure of 100 psig and an estimated compression cost of $0.07 per thousand cu ft.

TERRY

LARGE CLEARANCES take the "worry" out of Turbine Operation

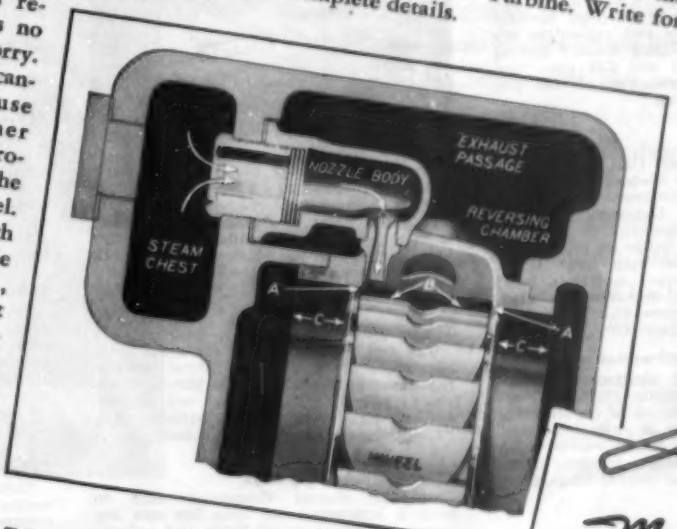


In a Terry Solid-wheel Turbine the power-producing action of the steam in the wheel takes place on the curved surfaces at the back of the buckets. This unique design permits unusually large blade clearance—see B in the diagram.

Even if this clearance becomes reduced, there is no real cause for worry. The blades still cannot foul because they are further protected by projecting rims at the sides of the wheel. These rims, which also have ample clearances (AA), will take without damage any rubbing that may occur.

Side clearance, CC, is so large that end-play from external thrust will not damage the wheel. This clearance is one inch or even greater.

Large side and blade clearances are only two of the many features of the Terry Solid-wheel Turbine. Write for complete details.



THE TERRY STEAM TURBINE CO.
TERRY SQUARE, HARTFORD 1, CONN.

TT-1191

Memo

Send for a copy of bulletin S-116 which describes the many advantages of the Terry Solid-wheel Turbine.

Circle 522 on Reply Card for more data

new bulletins

. . . catalogs from leading manufacturers

200—Pump Fundamentals

"Centrifugal Pump Fundamentals," 12-page booklet 7287, should be useful to all pump operators and installation and maintenance men since it explains principles of operation, defines various terms used in calculations, and works out typical pump problems. Ingersoll-Rand Co., Cameron Pump Dept.

201—Hose Coupling

"Titeflex Quick-Seal Coupling," 16-page booklet, describes a quick connect-disconnect hose coupling for water, oil, steam, gas, and chemical lines. Tables of working pressures, materials, and sizes are included. Titeflex, Inc.

202—Waste Treatment

"Industrial Waste Treatment," four-page folder WC-116, with schematic drawings, pictures, and problem-solution-result type explanation demonstrates how this company's equipment solves such problems as process and cooling water shortages, contamination of streams with plant effluents, and loss of valuable heat and materials in discarded waters and process liquors. Graver Water Conditioning Co.

203—Filters

Principles, construction, and advantages of the industrial Auto-Klean filters are described in full in eight-page booklet AK-050. Specifications and capacities are included for all standard models having flow rates between 1 and 3780 gpm, and normal operating pressures of 125 psi. Cuno Engineering Corp.

204—Turbines

Velocity stage class CA turbines described in four-page booklet 4202 are of simple rugged construction for use as mechanical drives. Cut-away drawing shows general arrangement of the turbines, which operate under all inlet steam conditions up to 600 psig and 750 F. Principal specifications, materials, and standard and optional features are listed. De Laval Steam Turbine Co.

205—Porcelain Construction

Porcelain chemical equipment is the subject of 24-page bulletin 436. Usefulness of porcelain as a material of construction is stressed. Equipment described includes Y and angle valves, safety valves, plug cocks, pipe and fittings, towers, tower plates and nozzles, and raschig rings. Lapp Insulator Co., Inc.

206—Refractories

Refractories, Coleman XX, for high duty services; and Coleman, for intermediate duty services, are described in eight-page bulletin ED-D. Charts show spalling resistance, results of load tests, and thermal expansion. Harbison-Walker Refractories Co.

207—Proportional Mixers

Air/gas proportional mixers for various operating conditions are pictured in four-page folder L. Summary information is given for each type along with the number of the bulletin giving detailed information. Tables show losses due to excess gas or excess air. Eclipse Fuel Co.

208—Industrial Lighting

"RLM Standard Specifications For Industrial Lighting Units," is the third revised addition of this handbook. It is completely indexed as to type of lighting unit and application, and gives luminaire distribution data, light flux values, and coefficient of utilization. RLM Standards Institute, Inc.

209—Pressure Switch Selection

Pressure switch selection has been put into plain, understandable terms in a selection chart based on specific requirements in 33-page booklet 4G. Data in this book includes detailed description and illustrations of the Shear-Seal principle and its application in manual and solenoid valves. Barksdale Valves.

210—Motor Pulleys

Complete redesign of the standard line of this company's Vari-Speed motor pulleys is described in 28-page catalog V-545. Lubrication, controls available, instruction on how to select the proper unit, complete rating tables, and dimensional diagrams are included. Reeves Pulley Co.

211—Orinoco Project

The full story of one of the great frontier epics of modern industrial history, the development of Orinoco Mining Company's rich Venezuelan iron ore deposit, is authoritatively told in bulletin 2500, "The Orinoco Project." Link-Belt Co.

212—Swivel Couplings

All-Flex Swivel Couplings, said to have a reputation for long life and dependable service in oil fields and refineries, are described in four-page catalog 234L. Each style of this low-pressure coupling is illustrated and described by means of a table of specifications. Multiple metal-backed packings, incorporated in these pipe couplings, are described in detail. H & N Manufacturing Corp.

213—Equalizing Slings

To make the job of lifting unequal or unbalanced loads an easy one, this company has designed the Adjust-A-Leg Equalizing and Locking Sling, illustrated in four-page folder 354. Typical examples of application in various industries are shown in photographs, and line drawings demonstrate methods of lifting different types of loads. Caldwell Co.

214—Plunger Pumps

Graphically illustrated by photos, charts, and line drawings, 11-page bulletin W-44-B45 contains information about features, applications, ratings, dimensions, and specifications of the VTE, VTE-1, and VTE-2 types of Plunger Pumps. Units are designed for application in fields such as the petroleum industry, flooding, and salt water disposal. Worthington Corp.

215—Cradle Mounted Pumps

Four-page, two-color bulletin 247 covering Cradle Mounted Compacunit pumps—types CLFC, CLC, CMC and CHC—includes basic design and construction features, sectional and external views, composite dimensions, material specifications, and other technical information. Warren Steam Pump Company, Inc.

216—Welders

Quality welding is done faster at the lowest cost with Shield-Arc welders according to eight-page bulletin 1337. Sectional views, and application photos are given for 200 amp gasoline engine-driven units, 300 amp diesel engine-driven units, 300 amp gasoline engine welder, 400 amp gasoline engine-driven unit, 600 amp gasoline engine welder. Lincoln Electric Co.

217—Diesel Lubrication

Written for everyone interested in the lubrication of diesels, "Lubrication of Diesel Engines," has been revised as technical bulletin B-1, 48-pages. It discusses diesel principles and design, types of engines in use, operating cycles, accessories and choice of correct diesel lubricants. Sun Oil Co.

218—Industrial Gear Lubricants

The new and improved line of extreme pressure industrial gear lubricants to replace Stanogear Leaded Lubricants and Stanogear EP Lubricants is discussed in six-page technical bulletin X-417. Every engineer with lubrication problems should have this booklet as general reference material. Standard Oil Co. (Indiana)

219—Commercial Air Conditioner

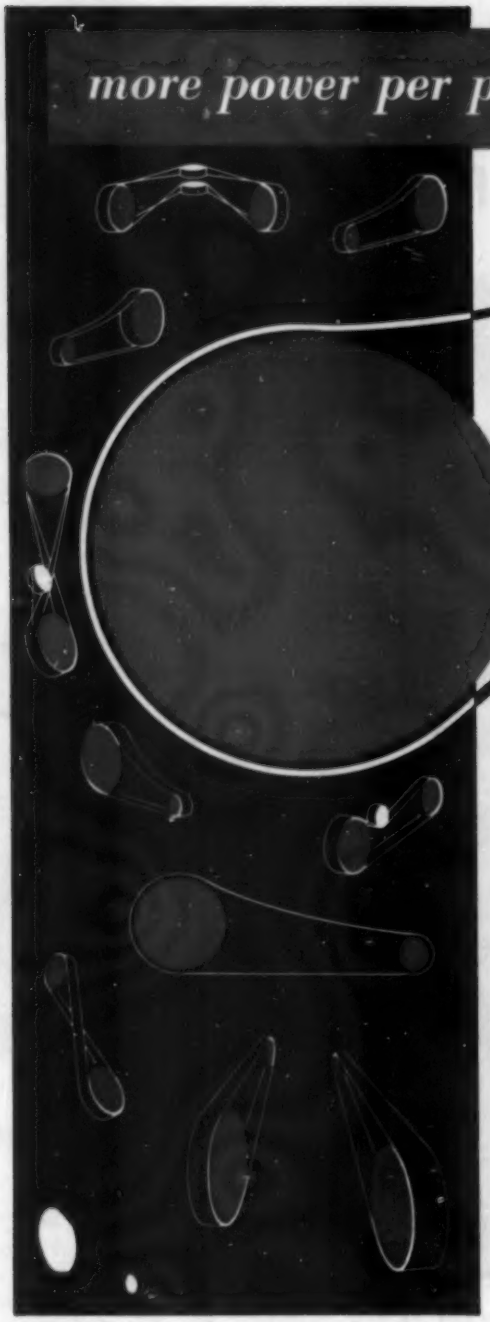
Ceiling-mounted and floor-mounted central station air conditioner units for commercial and industrial applications are the subject of seven-page bulletin C-1100-B33B. Included are tables of specifications, dimensions, accessories, physical data, and features of both types. Worthington Corp.

220—Machine Mounting

Based on research and knowledge of the machine mounting field gained since introduction of Leveling Barrymounts, this recommendation booklet will enable you to determine quickly the proper mount

NOTE — Each new bulletin item has a key number for your convenience in asking for a free, personal copy. Circle key numbers on Reply Card between pages 34/35 & 98/99.

more power per ply..."more use per dollar"...



with **CONDOR COMPENSATED BELT**

Engineered for more power and longer belt life, users report Condor Compensated Belt lasts three to four times longer on many drives than ordinary transmission belts.

The R/M Compensation principle equalizes stresses between the plies . . . eliminates "loafing" inner plies and over-worked outer plies to prevent outer ply ruptures, fastener troubles and ply separation . . . causes of most transmission belt failures.

Condor Compensated Belt is designed to meet every need in a selection of driving surfaces . . . from low-tension to a required degree of slip, as on winder drives.

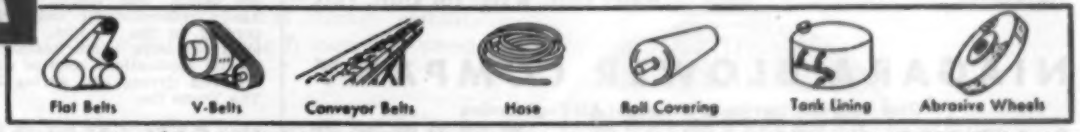
Whatever your requirements, you get more power with Condor Compensated Belt because each ply pulls its equal share of the load . . ."More Use Per Dollar" because it improves machine operation and lasts longer.

Ask your R/M Distributor for Bulletin 6808 . . . and ask him also about "more use per dollar" features of R/M hose, V-belts and conveyor belts.

RM

MANHATTAN RUBBER DIVISION—PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.



Other R/M products include: Industrial Rubber • Fan Belts • Radiator Hose • Brake Linings • Brake Blocks • Clutch Facings
Asbestos Textiles • Packings • Engineered Plastic, and Sintered Metal Products • Bowling Balls

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You Get Trustworthy Liquid or Gas Cooling With Great Cooling Water Savings from the NIAGARA AERO HEAT EXCHANGER

● You can cool air, gas, water, oils, chemicals, electric and power and process equipment, engines, mechanical processes with lower cost and really accurate control of temperature with the Niagara Aero Heat Exchanger.

You are assured of uniform, constant production and quality from any process . . . steady, reliable operation . . . lower cost for more dependable cooling. You can have closed system cooling with freedom from scale, dirt, corrosion and maintenance troubles. You can accurately cool more than one type of liquid with one machine.

The Niagara Aero Heat Exchanger uses atmospheric air to cool liquids and gases by evaporative cooling. You can remove heat at the rate of input to keep accurate control of gas or liquid temperature. You can put heat back into the system to save the losses of a "warm-up" period or to equalize the effect of load variations.

Great savings in cooling water and savings in piping, pumping and power return the cost to you quickly. The Niagara Aero Heat Exchanger can save you approximately 95% of your cooling water cost. Write for Bull. 120.

NIAGARA BLOWER COMPANY

Over 35 Years Service in Industrial Air Engineering

Dept. IP, 405 Lexington Ave. New York 17, N. Y.

Experienced District Engineers in Principal Cities of United States and Canada

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new bulletins

—Starts on page 34

for most types of punch presses, grinders, lathes, and milling machines. As pointed out in the booklet, Barrymounts permit installation and leveling of heavy machines in a matter of minutes without bolting or shims. The Barry Corp.

221—Selection Procedures

For the man with the problem of specifying refrigeration and air conditioning equipment in the 15 through 220 tons capacities, six-page bulletin 220 explains selection procedures that enable the user to obtain a unit tailored to his exact requirements. Acme Industries, Inc.

222—Pneumatic Controllers

Stack-type pneumatic controllers for process variables are illustrated with cutaway construction photos, schematic diagrams, and dimension drawings in 12-page catalog 53-10. Included are details of case-mounted, field-mounted, and valve-mounted control instruments. Fischer & Porter Co.

223—Steam Heating Systems

Five major types of steam heating systems, with and without control, and a full line of valves, traps, and steam power specialties are described in 19-page bulletin 110. It features the Selectotherm System which is an automatically controlled high vacuum steam heating system that adjusts its heat output and fuel consumption to outdoor temperature and heat loss conditions. Illinois Engineering Co., Div. of American Air Filter Co., Inc.

TO REQUEST FREE BULLETINS

Circle "key" numbers on Reply Card between pgs. 34/35 & 98/99. Your requests will be handled promptly.

224—Portable Power Saw

Two-page data sheet explains operation of a Portable Power Pipe Saw for on-the-job cutting of 2 to 8 in. cast iron and steel pipe as well as bar stock and beams. Illustrations show how field cuts formerly made by hand can now be machine made in a matter of minutes. E. H. Wachs Co.

225—Liquid Level Indicators

Revised 19-page bulletin WG 1824 describing remote liquid level indicators has been brought up to date with new installation pictures, discussions of the new wide vision dial, the electronic secondary indicator, and the ASME boiler code application of independent remote level indicators for boiler pressures 900 psi and above. Yarnall-Waring Co.

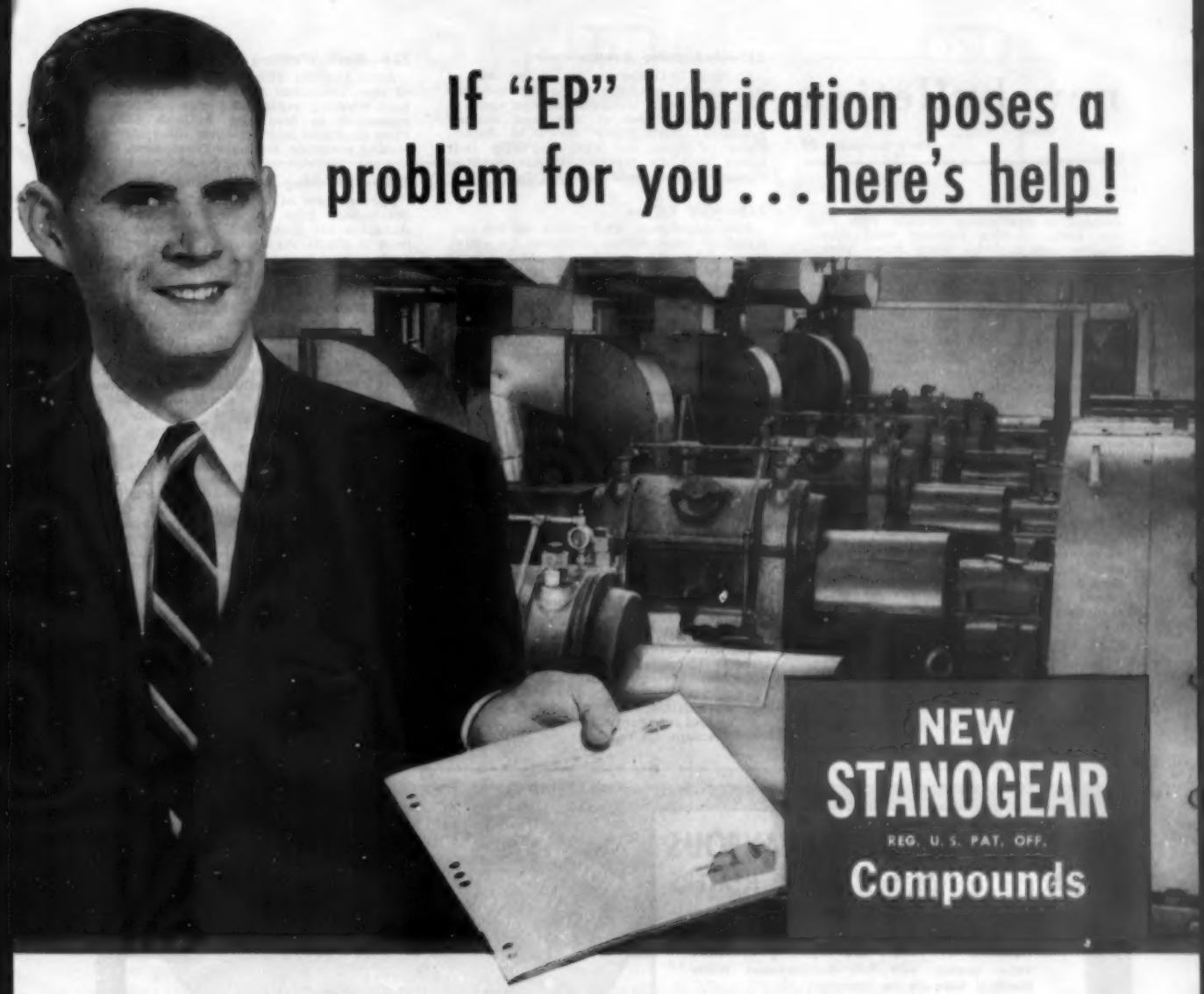
226—Boiler-Type Unit Heater

The Torridor, a high capacity boiler-type unit heater, is described in bulletin DS-327A. Roughing-in dimensions, capacity tables, and piping details provide handy reference for unit selection. According to the booklet, these units are ideal for large space heating as well as special applications such as door blanketing, and drying and curing installations. The Trane Co.

227—Simplified Scaffolding

For construction, maintenance, and in shoring applications, this company has

If "EP" lubrication poses a problem for you . . . here's help!



Here's new technical letter on Stanogear Compounds—send for free copy today!

If you've been having lubricating problems with overloaded or shock-loaded gears on your equipment, New STANOGEAR Compounds—with 7 better EP lubricating features—are made just for you. New and improved STANOGEAR Compounds are recommended for industrial gear applications where the operating conditions of the gear unit demand an extreme pressure lubricant . . . their superiority has been proved in test after test and *on the job!*

New STANOGEAR Compounds work seven ways better to solve your EP problems: **1.** higher load-carrying capacity **2.** superior retention of load-carrying capacity **3.** freedom from objectionable deposits **4.** excellent storage stability **5.** good water separation **6.** anti-foaming **7.** increased versatility

Now Standard Oil has prepared a special technical letter to give the complete story on STANOGEAR Compounds and EP lubrication. For your copy of this factual, informative bulletin, call your nearest Standard Oil office. The Standard Oil lubrication specialist there can answer your questions and send you a copy of the EP story, without obligation. Or write to: Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

STANDARD OIL COMPANY

STANDARD (Indiana)

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new bulletins

—Starts on page 34

devised a scaffolding system with only one basic part—a tubular steel frame. Twelve-page bulletin 8-001, shows principal of assembly, illustrates various applications, and shows all component parts in scale. Brainard Steel Div. of Sharon Steel Corp.

228—Heavy-Duty Chain Drives

Revised 16-page catalog C72-51 includes all new and expanded data on capacity ratings of the Hy-Vo high speed, heavy-duty chain drives including operating principles and test data for drives that will carry up to 190 hp per in. of chain width at continuous chain speeds up to 6000 ft per min. Installation and lubrication recommendations are also included. Morse Chain Co.

229—Sprockets and Chains

Latest technical data on all items in the newly extended Taper-Lock line, which now includes sprockets and chains for sizes ranging from 40 through 160, are contained in four-page bulletin A-632. Dodge Manufacturing Corp.

230—Skip Hoists

Sixteen-page booklet CB3654 shows sequence views of operation of weigh type and plug feed loading gates. It lists capacities of various size buckets traveling various lifts at different speeds. C.O. Bartlett & Snow Co.

231—Industrial Rubber

Catalog 25-C covers the entire line of R/M rubber products made for industry such as V-belts, transmission and conveyor belts, all types of hose, and molded products. Highlighted are R/M Super-Power V-Belts, the XDC Conveyor Belt Cover, and the Hydro-Lok Rubber Pipe Flange. Raybestos-Manhattan, Inc.

232—Mud Valves

Four-page folder 12-S points out the outstanding construction features for extra long service life and low maintenance of the 2000 psi W. P. and 3000 psi W. P. alloy steel mud valves. Interchangeability of parts is stressed along with simplicity of operation. Edward Valves, Inc. Subsidiary of Rockwell Mfg. Co.

233—Power Plant Equipment

Custom engineered equipment for petroleum refineries, chemical plants, and power plants are pictured in use in these industries in 12-page bulletin E-1. Included in this line of equipment are stills and towers, heat exchangers, reactors, oil chillers, crystallizers, steam generators, and ice making and refrigerating machinery. Henry Vogt Machine Co.

234—Back Washing

Auto Central Filter Control, a system of semi-automatic sequence operation for back-washing rapid sand water filters is explained in four-page bulletin 480-L1. Flow diagrams and drawings illustrate operating principle. Builders-Providence, Inc.

235—Clay Pipe Applications

Special uses of vitrified clay pipe and Screw-Seal pipe in industrial duct installation are illustrated in five-page bulletin R-653-30. Applications described include use as heating, air-conditioning, and fume ducts. Robinson Clay Product Co.

236—Maintenance Cleaning

How-to-do-it charts based on actual in-plant maintenance procedures are a feature of "Plant Maintenance Cleaning Guide," 12-page booklet F. 9304. It includes descriptions of cleaning materials, solution-lifting steam guns, and this company's hot spray unit. Oakite Products, Inc.

237—Concrete Floors

"Concrete Floors Now—and for the Future," 28-page booklet describes the absorption process method of installing heavy-duty concrete to floors in a step-by-step pictorial sequence. Advantages of this flooring and examples of successful applications in all types of industrial buildings are given. Kalman Floor Co.

238—Unit Heater Data

Forty-five-page bulletin 7817 will give you a sound working knowledge of unit heaters for steam or hot water applications. Information contained covers features of design, general engineering data, capacity tables, and piping diagrams for the recently introduced Venturafin unit heaters. American Blower Corp.

(Continued on page 94)

Pick INSTANTANEOUS HOT WATER HEATERS
ENGINEERED FOR SERVICE

Industries everywhere are replacing outmoded water heaters with Pick Instantaneous Water Heaters. Here are the reasons:

★ Water Is Heated Instantly. Entirely automatic, Pick Heaters operate by steam injection to heat the water in a flash to exact temperature desired and in volume required.

★ Fuel Savings Are Substantial. Steam injection heating is the most efficient method known. There's no waste because water is heated only as used . . . never stored and allowed to cool.

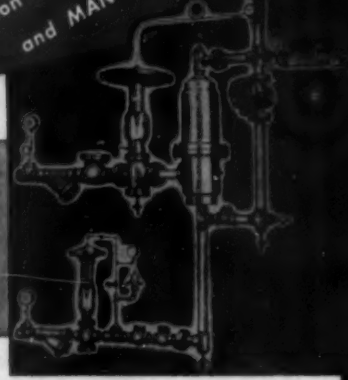
★ No Storage Tanks Required. Compact design of Pick Heaters permits out-of-the-way installation in corners, on walls or overhead. Saves valuable floor space.

★ Exact Temperature Control. Pick heaters can be operated at low or high loads with minimum temperature fluctuation. And it's done quietly.

★ Maintenance Cost Is Low. Pick Heaters can be cleaned in a matter of minutes — worn parts easily replaced.

★ Installation Is Inexpensive. Only ordinary pipe connections are required.

PICK HOT WATER HEATERS . . . Used by
• United States Steel Co.
• Ford Motor Co.
• H. J. Heinz
• Bethlehem Steel Corp.
• Hercules Powder
• Wilson & Co.
and MANY OTHERS



SAVES MONEY FOR ANY INDUSTRY THAT USES HOT WATER!

Write for booklet on how PICK HEATERS cut costs of Hot Water — No Obligation. Write IP 554

PICK MANUFACTURING CO. • WEST BEND, WIS.

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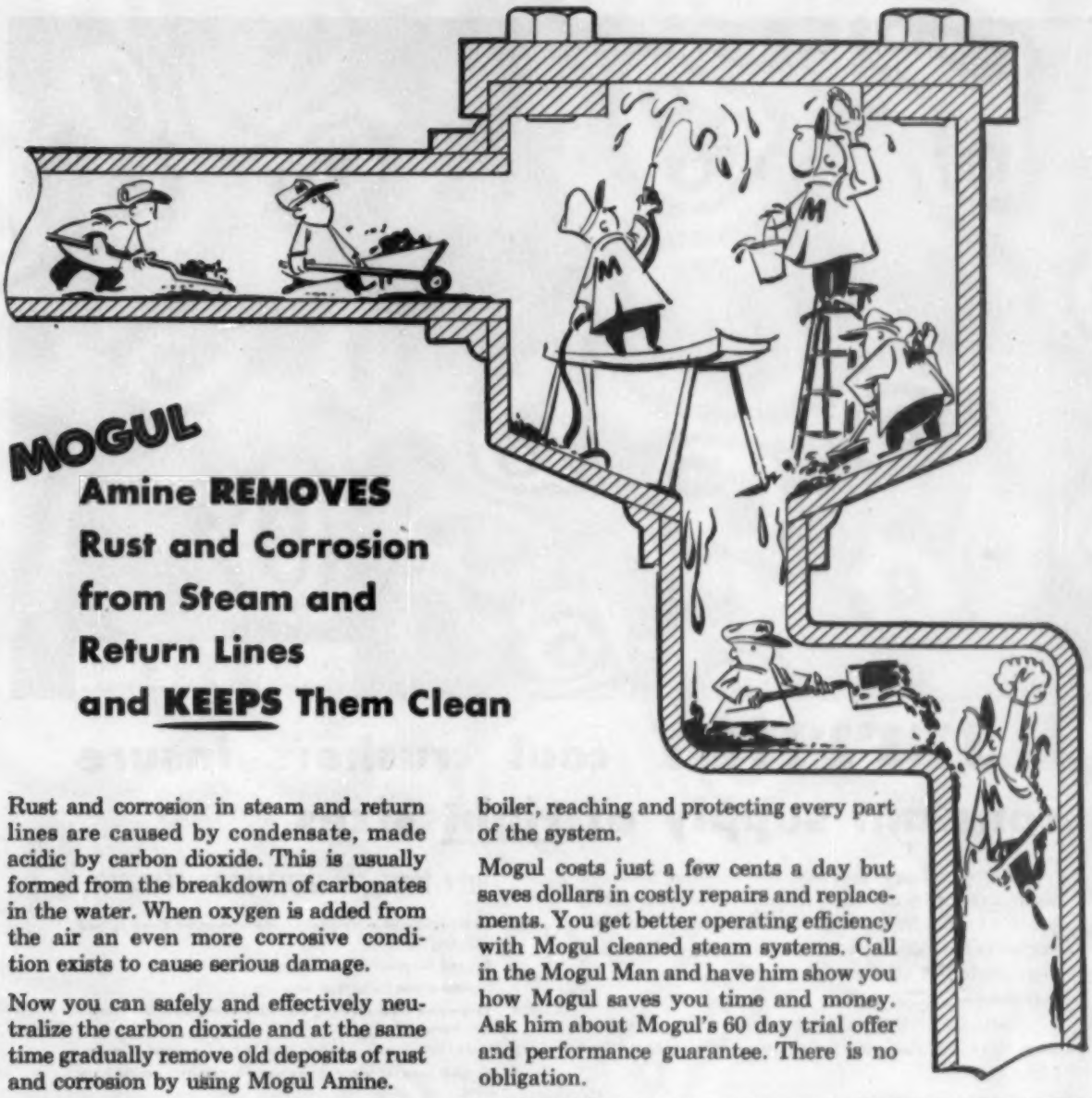

MOGUL

Amine REMOVES Rust and Corrosion from Steam and Return Lines and KEEPS Them Clean

Rust and corrosion in steam and return lines are caused by condensate, made acidic by carbon dioxide. This is usually formed from the breakdown of carbonates in the water. When oxygen is added from the air an even more corrosive condition exists to cause serious damage.

Now you can safely and effectively neutralize the carbon dioxide and at the same time gradually remove old deposits of rust and corrosion by using Mogul Amine.

Mogul Amine is a carefully compounded liquid, readily mixed with water, that is injected into the boiler or directly into the steam lines. It vaporizes and travels with the steam, condensing as the steam condenses. Mogul Amine continues with the condensate through the traps, return lines, condensate tank and back to the boiler, reaching and protecting every part of the system.

Mogul costs just a few cents a day but saves dollars in costly repairs and replacements. You get better operating efficiency with Mogul cleaned steam systems. Call in the Mogul Man and have him show you how Mogul saves you time and money. Ask him about Mogul's 60 day trial offer and performance guarantee. There is no obligation.

The North American MOGUL Products Company
Cleveland 13, Ohio

The North American Mogul Products Company
Standard Building, Cleveland 13, Ohio

Send me information on Mogul Treatment for applications checked.

- ☐ Steam and Return Lines
- ☐ Hot Water and Steam Heating
- ☐ Cooling Water Systems
- ☐ Air Conditioning
- ☐ Hot and Cold Water Supply Systems
- ☐ Wet-Type Dust Collectors

Name _____

Title _____

Company _____

Address _____

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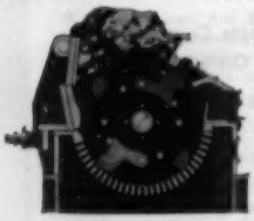
Jeffrey FLEXTOOTH Coal Crusher in action at power plant.

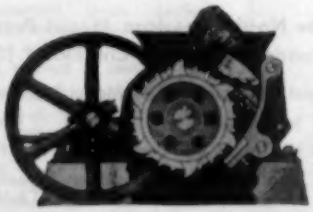
JEFFREY coal crushers insure constant supply of right sizes

Jeffrey's long experience with crushing problems assures that the coal sizing installation for *your* power plant will give greatest profit and satisfaction. Our engineers have developed a complete range of crushers that produce a constant supply of uniform sizes for top operating efficiency.

Jeffrey FLEXTOOTH and Rotary Ring Crushers were especially designed for stokers and powdered fuel plant grinders.



FLEXTOOTH Coal Crusher



Jeffrey Single Roll Crusher

CHECK THESE TEN OUTSTANDING FEATURES:

1. Reduces run-of-mine coal in one operation down to and including ¼".
2. Rugged construction with all-welded steel frame.
3. Highest grade roller type bearings.
4. Renewable steel crushing elements swing back on contact with tramp iron.
5. Heavy fly wheel pulley furnishes belt drive direct to motor.
6. Hinged breaker plate gives easy access to interior from front.
7. Built-in metal catcher may be emptied easily without stopping production.
8. Hinged doors at back have T headed bolts and latches. No bolts to lose when doors are opened.
9. Low frame requires no more head room than ordinary crusher.
10. Large screen bar area assures large capacity and uniform product.

WRITE FOR CATALOG 784-B

THE JEFFREY MANUFACTURING CO.

ESTABLISHED 1877

Columbus 16, Ohio

sales offices and distributors in principal cities

PLANTS IN CANADA, ENGLAND, SOUTH AFRICA

IF IT'S MINED, PROCESSED OR MOVED

. . .IT'S A JOB FOR JEFFREY!

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Ultra-Modern Design

Administration and Research Center
S. C. Johnson & Son, Inc., Racine, Wis.
Architect: Frank Lloyd Wright
Consulting Mechanical Engineers:
Samuel R. Lewis & Associates

...fired by **coal**

In the famous plant of Johnson's Wax, modern equipment makes coal a clean and automatic fuel . . . and saves dollars year after year.

Says: Adrian Wilson, Power Plant Assistant Manager
S. C. Johnson & Son, Inc.
Racine, Wisconsin

"Our plant uses an average of 900 tons of coal per month. At the conclusion of a recent analysis of relative fuel costs, we were unable to justify a change from coal to any other fuel. In burning coal the modern way, we have steadily improved the efficiency of our power plant."

•

If you plan to modernize—or to build a new plant, be sure to investigate the convenience and money-saving advantages of coal when burned with modern equipment.

You can enjoy automatic operation and save on labor by installing up-to-date coal-feeding and ash-handling systems. And you can eliminate dust or smoke nuisances with such devices as dust collectors and cinder rejectors. Often such equipment can pay for itself in fuel and labor savings in only a few short years.

Get the advice of a consulting engineer. He can make a fuel analysis for you. He can advise you on what equipment can best fill your specific needs and return you a big saving year after year with coal.

YOUR BEST BUY IS BITUMINOUS

- **Today's lowest-cost fuel,** in most places, is Bituminous Coal!
- **The most stable fuel in price is coal,** because coal reserves are virtually inexhaustible . . . coal mining is highly mechanized.
- **The safest fuel to store and use** is coal.
- **Your best bet for saving dollars is coal** . . . for modern equipment greatly multiplies coal's inherent advantages.

Additional case histories, showing how other types of plants have modernized and saved money by burning coal with modern equipment, are available upon request.

BITUMINOUS COAL INSTITUTE
A Department of National Coal Association
Southern Building, Washington 5, D. C.

FOR HIGH EFFICIENCY FOR LOW COST

YOU CAN COUNT ON COAL!

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Super Tough

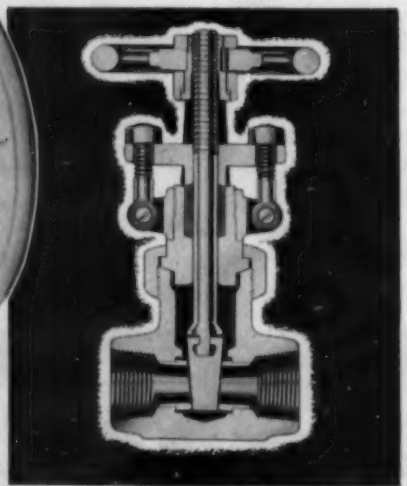
Chapman List 960

Small Forged Steel Gate Valve

Super means "way beyond the ordinary" and that's just what this rugged gate valve is . . . it's tough enough to lick *any* gate valve problem in its range . . . dependable enough to keep maintenance costs down under the most severe conditions. That's why List 960 is specified for more different applications than any other valve of its kind.

Chapman List 960 is tough because . . . wedge faces are hardened to 800 Brinell, so they won't seize or gall . . . seat rings are hardened stainless steel, so closure is always tight and operation is always smooth, without excessive wear . . . stem-and-gate connection is extra-husky to stand up under even unusual stresses.

Specify Chapman List 960 for every use you have for small forged steel gate valves. In sizes from ¼" to 2". Rising stem with yoke (shown) or rising stem with inside screw. Bonnet joint is either metal to metal or gasketed, depending upon application. Pressure range is from 380 pounds at 1000°F to 2000 pounds at 100°F. For higher ratings, specify List 990. Write today for your copy of Catalog 10.



The CHAPMAN Valve Manufacturing Co.
INDIAN ORCHARD, MASSACHUSETTS

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HERE IS AN IMPORTANT NEW BOOK ON WATER TREATMENT WITH AMBERLITE ION EXCHANGE RESINS

"If You Use Water" is a 24-page 1954 publication about the increasingly important subject of water treatment by ion exchange. It's yours without charge, simply by writing and asking for it.

"If You Use Water" discusses the application of the AMBERLITE ion exchange resins to all phases of water treatment, including softening, dealkalization, deionization, and silica removal for boiler feed and other uses. Amply illustrated with flow diagrams, this book points to the solution of a host of water conditioning problems.

Prepared by Rohm & Haas Company ion exchange specialists, "If You Use Water" shows you the way to decreased cost and increased quality of water treatment. In addition, it tells you about the use of the AMBERLITE ion exchange resins in research, medical therapy, air conditioning, television tube manufacture, food processing, printing, electroplating, and other important fields.

Send for your free copy of this booklet today

CHEMICALS FOR INDUSTRY

ROHM & HAAS COMPANY

THE RESINOUS PRODUCTS DIVISION

Washington Square, Philadelphia 5, Pa.

Representatives in principal foreign countries

AMBERLITE is a trademark, Reg. U.S. Pat. Off. and in other principal countries of the Western Hemisphere.

ROHM & HAAS COMPANY, Dept. IP-1
Washington Square, Philadelphia 5, Pa.

Please send my copy of "If You Use Water..."

Name_____

Title_____

Firm Name_____

Address_____

City_____ Zone____ State____

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How to Select an Economical Temperature Regulator

First of all, what does economy mean where temperature regulators are concerned? In some industries it means improvement of product or reduction of spoilage through closer control of process temperatures. In others, it means the paring down of operating expense. The price of the regulator itself is a relatively small factor.

Today's buyers are shopping for:

1. Accuracy of control — not only when the regulator is new, but throughout its service life
2. Dependability — to prevent loss of production time
3. Minimum installation and maintenance cost

Here are a few tips on what to look for when you're installing a new or replacing an old temperature regulator —

Packless construction . . . and for this reason: A diaphragm operated, packless regulator minimizes friction. There are no closely fitted parts to stick or bind because of uneven expansion or collection of foreign matter. Also, there's less maintenance, since no repacking is ever required.

A guarantee against wire drawing of the seats and discs. Insist on it. This guarantee in combination with single seat design assures you of tight shutoff; you avoid expensive steam losses as well as loss of product in a process application.

Broad control range. In a standard regulator you should expect a control range of 100 F. And make sure the unit you select has a vapor tension thermostat that can take over-temperatures of at least 100 F.

Easy maintenance. Why ask for grief? Your temperature regulator should be basically simple in design so that it can be serviced by average plant personnel. All parts should be readily accessible for testing and cleaning.

Double duty. There's no point in buying a separate pressure regulator when you can select a temperature regulator that combines both temperature and pressure control within the same unit.

Self-operating. Make sure you get a regulator that operates on its own initial pressure. By doing so, you avoid the purchasing and maintenance of an air compressor plus air piping, and you're sure of uninterrupted operation during electric power failures.

• • • •

All of these points are important to you when it comes to selecting an economical temperature regulator. Perhaps you didn't realize you *could* expect so much. And perhaps you didn't realize that Spence Temperature Regulators offer all these features and more. May we send you our Bulletin T 500 containing further details? SE 130

SPENCE ENGINEERING COMPANY, INC.
Walden, New York

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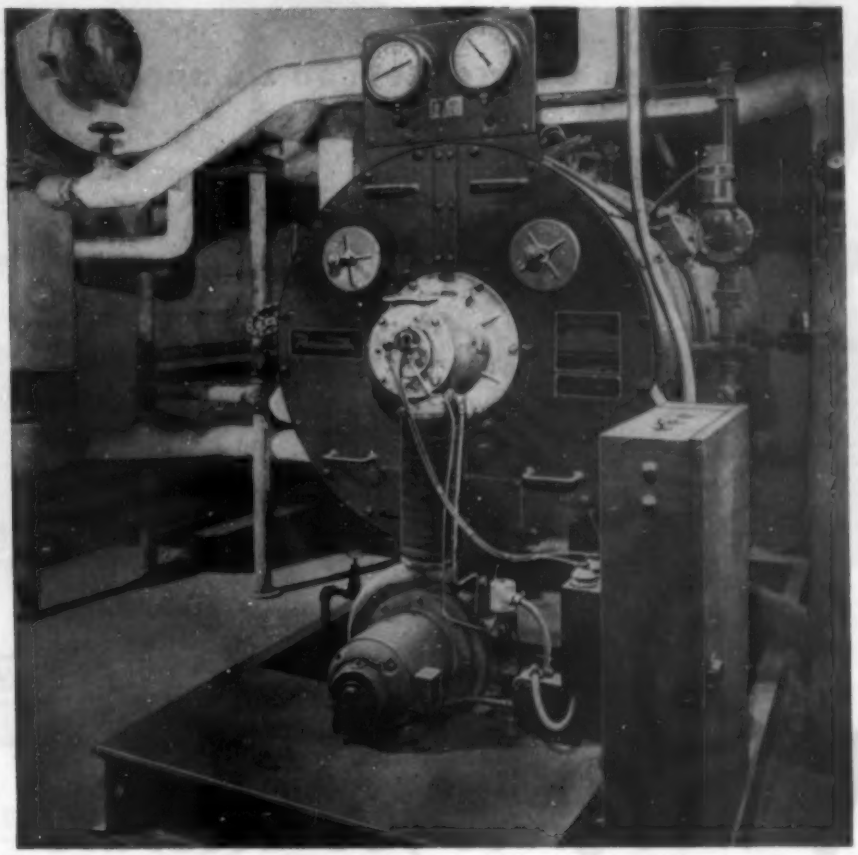
in CHEMICAL INDUSTRIES



Powermaster® Saves in Many Ways!

FOR EXAMPLE: The Davison Chemical Corporation's new multi-building fertilizer plant at New Albany, Indiana, is heated entirely by this oil-fired *Powermaster* Packaged Automatic Boiler.

Savings start with *Powermaster's* simplified installation . . . no special foundation or costly stack is required. A factory-assembled packaged unit, fire-tested before shipment, it is delivered complete, ready for operation as soon as fuel, water, electrical and steam connections are made. Other cost-saving *Powermaster* advantages include high fuel economy at all loads, space-saving compactness, dependability, maintenance-saving accessibility, fully automatic operating and safety controls, hospital-clean boiler room and smokeless combustion. *Powermasters* are entirely designed and built by Orr & Sembower, and are rigidly fire-tested before shipment.

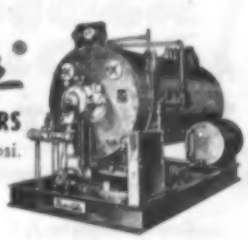
Compare *Powermaster* feature by feature, and you'll see why it is so popular for use in industrial plants, institutions, housing projects, hotels, churches, schools, laundries and all types of buildings. Send now for latest bulletins.

O·S

Powermaster®

PACKAGED AUTOMATIC BOILERS

sizes to 500 HP, Pressures to 250 psi.



ORR & SEMBOWER, INC. • Established 1885 • **Morgantown Road, Reading, Penna.**

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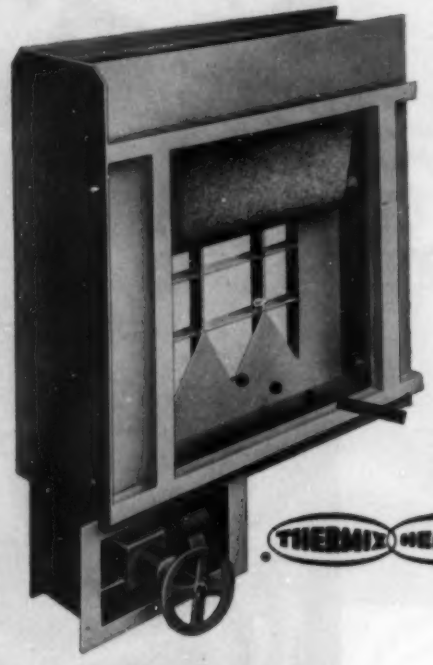
Only a Heacon Damper offers you this



"V" The V that gives you accurate control in the lower flow increments

Heacon Dampers provide the only solution to accurate flow control. With a background of over a decade of application to specialized problems, Heacon Dampers are accepted by engineers as the only means of accurate flow control, particularly in the lower flow increments.

V-porting is the secret. Heacon Dampers may be designed with V-porting to produce practically any flow characteristic from zero to 100%. With conventional dampers barely cracked, a flow of 10 to 20% or more is immediately released with resultant flow control problems in the entire system.

Heacon Dampers are a radical departure from normal damper construction. Consisting of supporting grill, sealing strip and flexible curtain of woven blue asbestos, metal or other suitable material as determined by the application, Heacon Dampers are recommended for use where these two factors, among others, are of major importance:

1.—Accurate control and ease of operation by either manual or mechanical means.

2.—Positive, tight seal when damper is closed.

The Thermix Corp., Project Engineers for Heacon Dampers are specialists in the application of this damper to your particular requirements. Why not call their engineers today.

Project Engineers

THE THERMIX CORPORATION
GREENWICH, CONN.

(OFFICES IN 38 PRINCIPAL CITIES)

Canadian Affiliates: T. C. Chown, Ltd. 1440 St. Catherine St. W., Montreal 25, Quebec. 983 Bay St., Toronto 5, Ontario, Canada

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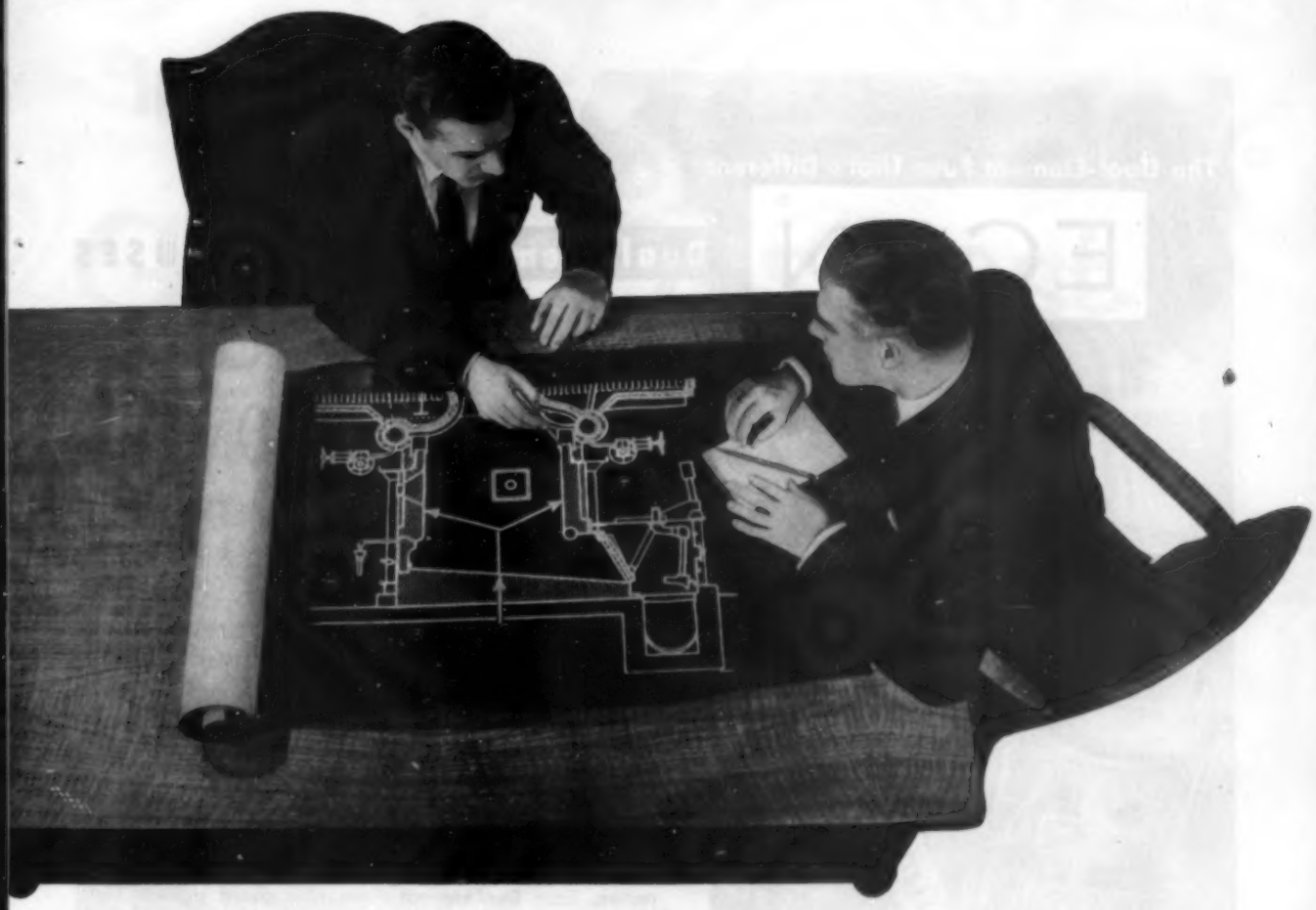

PROMINENT PUBLIC UTILITY

Cuts ashpit maintenance with B&W Refractory Concretes

A trial installation of B&W Refractory Castable "A", a 2600 degree refractory concrete, was made in one boiler ashpit. To date this castable has given 25 months more maintenance-free service than the refractories previously used.

Results of this first trial were so encouraging that another ashpit, shown in the drawing above, was lined with B&W Refractory Castable "A". In this installation the two opposing high velocity water sprays cut refractories life two ways. First, water splattered on the hot walls (about 1800F) caused spalling. Second, the high velocity water jets had an abrasive effect on the floor refractories.

Here's the report: "After 20½ months service, B&W's Castable "A" lining was still in excellent condition—far superior to the refractories used before."

On the basis of these trials three other boiler ashpits have been lined with this 2600 degree castable.

In addition to ashpit linings, B&W Refractory Castable "A" is widely used in boilers for baffles, hearths, door linings, special shapes, repairing eroded brickwork and forming pier walls in stoker-fired boilers.

B&W Castable "A" is only one of a line of B&W Refractory Concretes which cost-conscious furnace operators are putting to increasing use in hundreds of different applications. These B&W Concretes may help you cut installation costs and lengthen furnace life. Consult your B&W Field Engineer.

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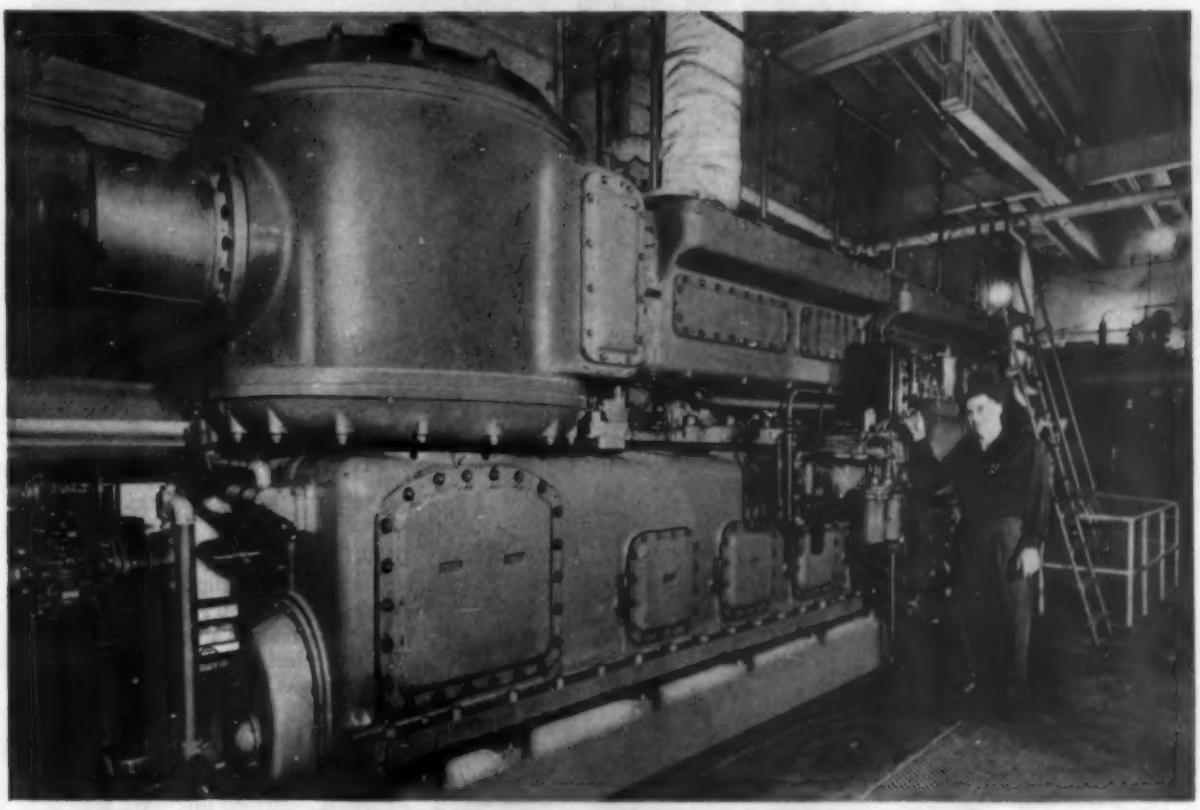

. . . says A.E. Harms, CHIEF ENGINEER

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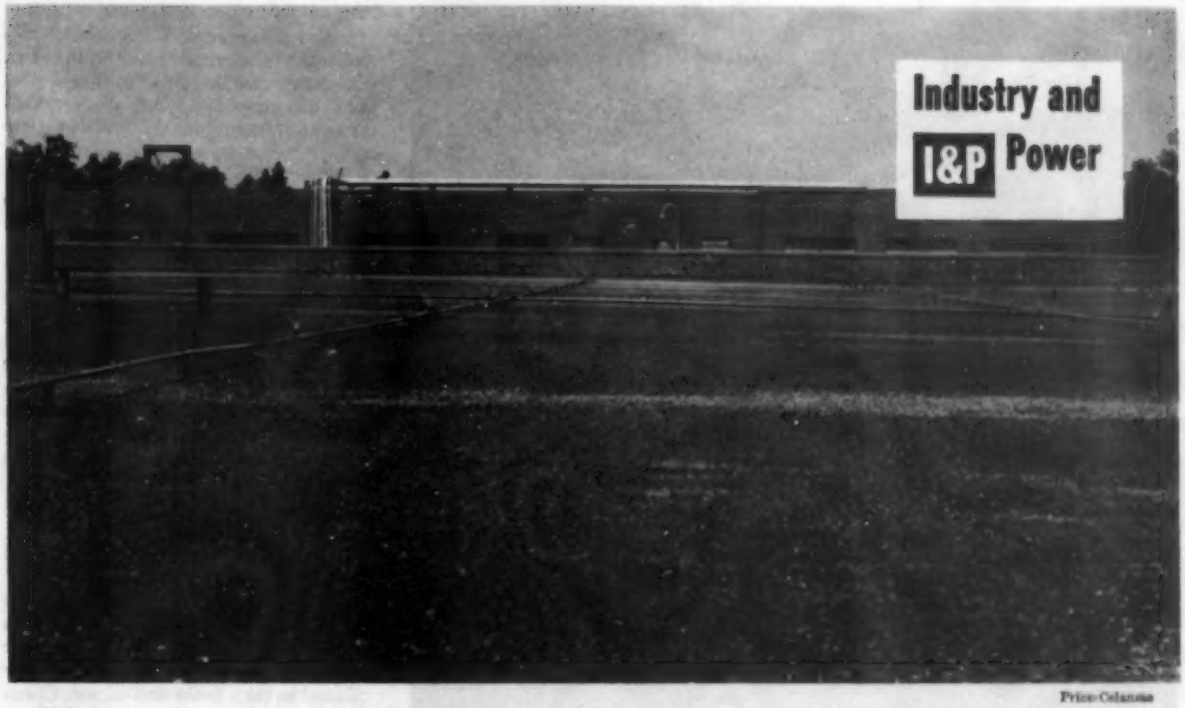


Price-Celanese

Moisture on this roof is well distributed with few puddles or dry spots. A thin film of water gives best results.

Roof Cooling . . . How it works

R. B. HAMILTON
Celanese Corporation of America

Price-Celanese

A jet of water, striking the spinning disk in this rotary spray, is broken up and distributed in an even pattern. The jet itself causes the disc to spin.

IF YOU HAVE A PLANT with a large roof area — large in comparison to the building volume — you may have discarded the idea of refrigerated air conditioning as too expensive. You recognize the value of summer air conditioning both from the point of view of quality control and increased production per man-hour, but the initial investment and the operating and maintenance cost of a standard refrigerated conditioning system is way out of line with the economic advantages gained. Perhaps the answer to your problem is evaporative roof cooling.

Perhaps your plant is already air conditioned either because your process requires constant temperature and humidity conditions winter and summer, or because you have recognized the savings involved in comfort air conditioning for the plant employees. You would like, however, to find some way to reduce the cost of operating the cooling equipment. Also, you have noted that the heat radiated from a hot ceiling below the roof makes working conditions uncomfortable even though the room air temperature

Price-Celanese

Puddles are undesirable. Stagnant water gets hotter than the air and insulates roof against the cooler air. It also serves to magnify the sun's rays.

may be well within the comfort zone. The heat of the sun radiating from the roof can raise the temperature of objects and persons within a working area without actually increasing the air temperature to any noticeable degree. Here again, the answer to your problem might be evaporative roof cooling.

When processes and personnel suffer from heat transfer through large roof areas, insulation is all too often the only method considered, but actually, insulation is only one of the possible solutions. Roof cooling, not a new art by any means, is coming into the picture more frequently every day. Roof cooling is inexpensive and simple — yet it is an effective answer to heat transfer through industrial plant roofs.

Possible Savings

To illustrate the amount of savings possible by the use of roof cooling, consider an industrial building with roof dimensions of 180 x 330 feet. Using outside design conditions for South Carolina, and assuming an 80 F inside temperature, a roof of precast concrete covered by insulation, pitch, and slag has a 14 Btu per sq ft of roof surface heat gain. Using the conditions assumed, the same roof with sprays in operation has a heat gain of less than 5 Btu per hr per sq ft. The total heat gained through the roof is reduced from 830,000 to 297,000 Btu per hr — a saving of 45 tons of cooling load.*

From a strictly economic point of view this illustration demonstrates two distinct ways of saving on a cooling installation. The refrigeration and air conditioning equipment can be sized smaller by 45 tons, thereby realizing a savings of about $22,000 in initial cost of the refrigerating equipment alone. (This is based on an estimated cost of $500 per ton). Using a figure of 1¢ per ton hr for operating cost of the refrigeration equipment, a savings of almost $4000 per yr can be realized.

There are other parts of the installation where savings can be brought about by the use of roof sprays. Not only is the refrigeration equipment itself of smaller size, but the air handling units, pumps, pipes, motor, wiring, and switchgear can be relatively smaller with resulting savings. Another important feature to be considered in an industrial installation is the floor area required by the equipment. It naturally follows that the smaller the equipment, the less space required to house it — and the more space left for production equipment.

*This roof surface heat gain can be calculated for any location and for any type of roof by using the formulas and methods presented in the chapter "Cooling Load", in the *Heating Ventilating and Air Conditioning Guide.*

Roof Cooling Systems

There are two different ways to use water for roof cooling, each method having certain advantages. However, a poorly designed roof cooling system can be worse than no roof cooling at all. For example, a stagnant pool of water on a roof can raise rather than lower the heat carried into the building. Not only does such a pool of still water become warmer than the air, but the sun shining through the liquid adds even more heat to the roof surface. This does not mean that a layer of water can not be used for cooling, but it does mean that this layer of water must be flowing.

Where water is plentiful, a cooling system can be used which involves a continuous flow of a sheet of water over the roof, with drains properly placed to take away the excess. Comparatively little evaporative cooling is accomplished with this system, but the water does absorb the heat from the sun and discharges it down the drain as heated water. The temperature of the supply water governs the amount of cooling that can be accomplished with this system. Furthermore, since the roof is always covered with a sheet of water, slime and algae will grow rapidly unless the water is thoroughly treated. Algae growth can be checked by allowing the roof to dry from time to time.

A disadvantage of using a continuous flow of water is that the roof must support the additional load added by the layer of water, and it is particularly important to eliminate all possible sources of water leakage into the building.

Roof Sprays

Roof sprays are probably the most efficient and economical way to achieve roof cooling, but there are design and operation problems that must be considered. Sprays operate on the evaporative cooling principle with the roof's surface approaching, but never reaching, the wet bulb temperature of the surrounding air.

For maximum cooling with sprays, the nozzles should not atomize the water into too fine a spray, for this would form an insulating blanket of mist over the roof and reduce evaporation from the roof surface. A very fine spray has the further disadvantage of wasting water when even

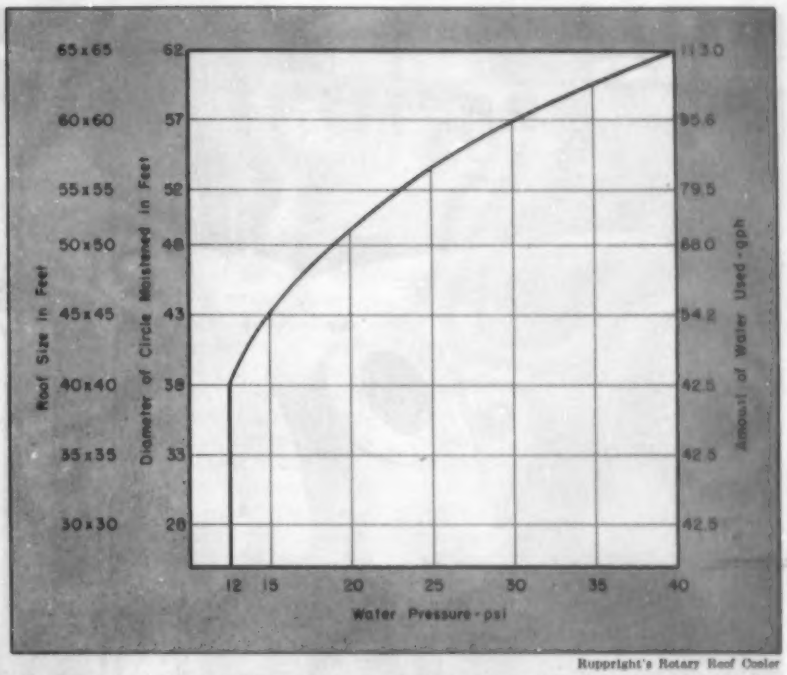
a light wind picks it up and carries it off the roof.

Regular lawn sprinklers do not make good roof sprays. They are not designed to give good coverage, and they use far too much water for the distribution pattern provided.

The best type of spray nozzle is one that will cover as large an area as possible with just enough water to keep the roof slightly moist so that natural evaporation can take place. There are roof sprinklers that rotate and distribute the droplets of water in a fan-shaped pattern, thereby providing very good coverage. There are also nozzles that produce a fine stream of water radially — with minimum atomization. Still other roof spray systems employ thermostats to shut the water off when the roof is cooled to a predetermined temperature, thereby insuring against the excessive use of water. All of these systems work well, but local conditions tend to dictate which system is best suited.

The amount of water used by a well designed spray system will normally be less than 5 gal per sq ft per month, based on an average operation of six hours per day.

The type of water available has some effect upon the choice of spray. Some of these spray nozzles are easier to clean than others, and all of them will become clogged unless the water used is clean and treated.

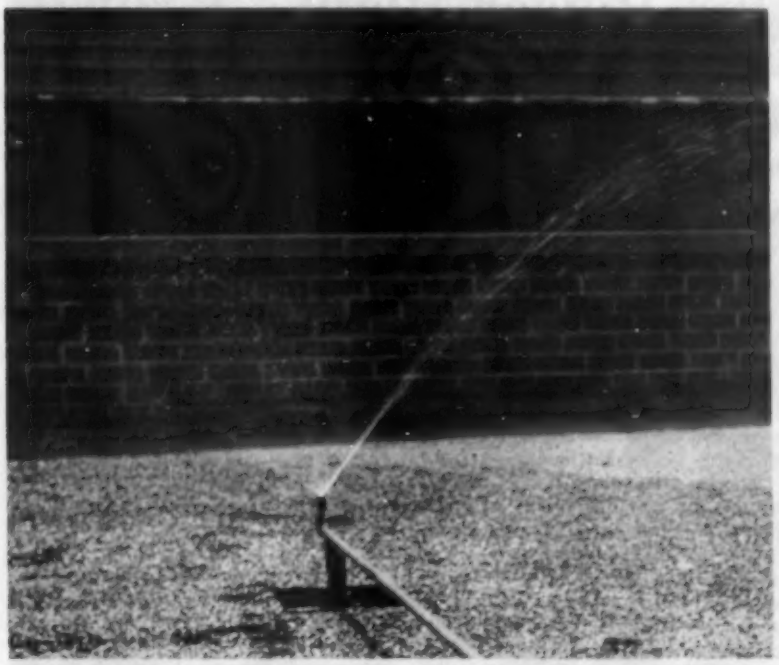


Ruppright's Rotary Roof Cooler

Coverage is determined by water pressure. The above chart is for a rotary unit.

On the other hand, even with relatively impure water, maintenance is simple on well designed nozzles. One manufacturer supplies a nozzle that can be cleaned merely with a touch of the hand. Pressing down on a floating disk will automatically remove small amounts of sludge or grit. With industrial water of a fair level of purity, maintenance merely involves a check every two or three weeks to flush the spray heads.

No roof spray system will reach its theoretically peak efficiency unless it has been designed so that the spray coverage is complete. It is also important for the roof to be level so that puddles and pools do not form. Very few of the installed roof spray systems are perfect in these respects, but they still do a creditable job.



Price-Colaness

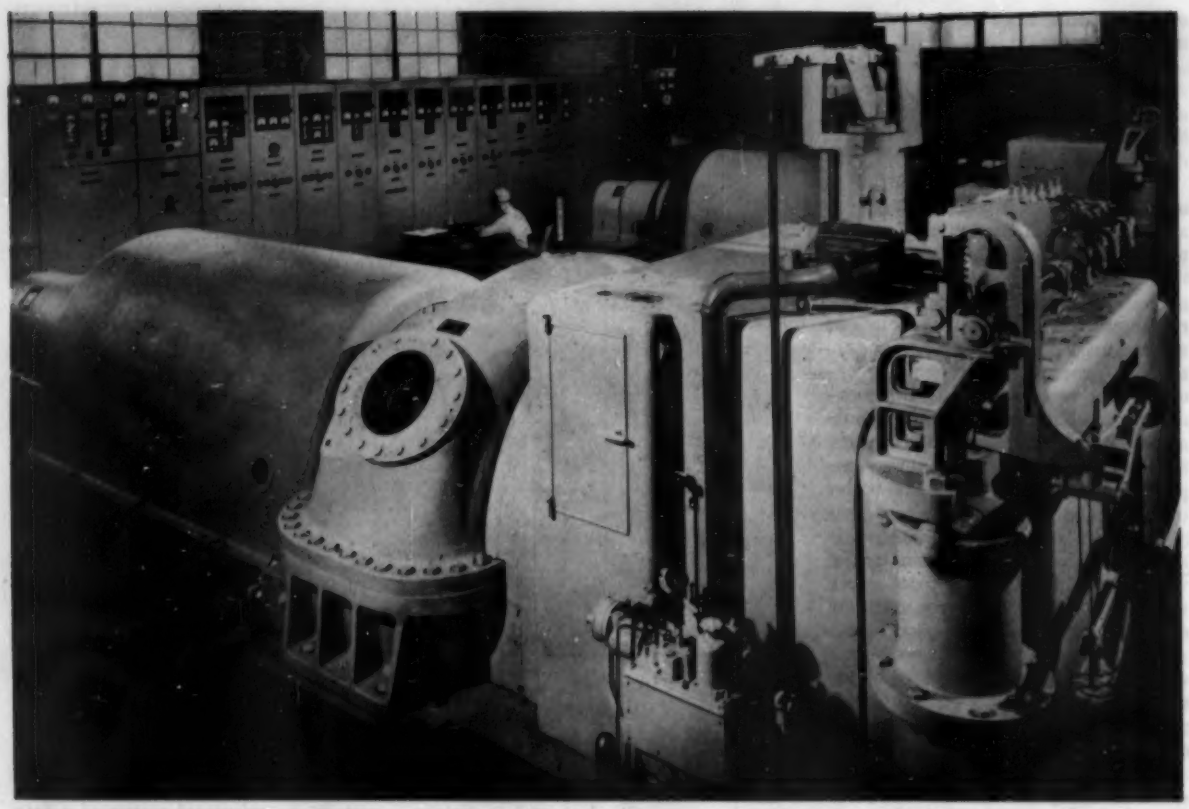
Uneven distribution caused by clogged nozzle. Dirt can be easily removed by pressing down on floating disk. Periodic checks assure efficient operation.

Summary

Spray roof coolers should be considered when designing a building that is to be mechanically or evaporatively cooled and for any existing building where mechanical or evaporative cooling equipment is being loaded beyond its capacity. The roof spray should also be considered for any building with a large roof surface in comparison to building volume whether or not air cooling equipment is installed.

The system should be designed for adequate coverage with minimum water consumption. The quantity and type of water available must be carefully considered, for an impure water will necessitate frequent cleaning of spray heads.

A well designed and efficiently operated roof cooling system can be a real money saver.



Two, 5000-kw turbine generators, one double extraction-condensing and one extraction-noncondensing, meet power demands.

We Planned Our Power Plant's Growth

I&P EXCLUSIVE

R. L. HARMER, Plant Engineer
American Box Board Company

L. D. BECHTEL, Vice President
Power Plant Division, Sumner Sollitt Company

ONE OF THE FOREMOST pulp and paper manufacturers in the country, the American Box Board Company of Grand Rapids, Michigan, has completed the installation of new power facilities at their Filer City plant, some 300 miles north of Chicago, Illinois. This extensive expansion and modernization program started in 1948 with the installation of a 5000-kw, double extraction-condensing turbine generator; a 125,000 lb per hr, pulverized coal fired boiler unit, complete with pertinent auxiliaries; water treating facilities; and building structures. Details of this initial phase of the project appeared in the December 1950 issue of INDUSTRY AND POWER. Since that time, a second boiler and turbine generator have been added to complete the final phase of the expansion program.

These power plant facilities serve a nine-point, semichemical pulp and paper mill having a capacity of approximately 350 tons per day of corrugating medium. This mill is unusual in its design because it represents the world's first successful continuous cooking and refining operation. The pulp mill does not require stock pumps, stock piping, or thickeners—screw conveyors do most of the conveying job from raw chips to pulp, at remarkably high consistencies. A complete graphic panel board, some twenty feet long, including all instruments and remote controls, is the control center for the whole pulp mill operation (with the exception of the refiners, which are individually controlled).

Power Plant

While the process procedures attract much attention, the power plant is in its own right one of the show places of the mill. Successful engineering and construction of the power facilities have resulted in excellent performance. The good results were accomplished largely through close cooperation between the well qualified engineering staff of the American Box Board Company and the engineering and construction forces of the engineer-contractor, Sumner Sollitt Company.

At the start of the program, heat

balance studies indicated that a total rated capacity of 10,000 kw and a continuous capacity of 250,000 lb of steam per hr would satisfy the plant's power and steam demands. Various alternatives were considered, and a decision was reached to distribute the requirements equally among two turbine generators and two boiler units. With this arrangement the project could be divided into two steps, the first concurrent with the modernization of the existing mill facilities and the second with the addition of a new paper machine.

Turbine Generators

Development of the engineering details for the initial phase of the project led to the selection of a double extraction-condensing turbine generator because this type of unit offers the greatest flexibility for mill operations. Design throttle steam conditions are 610-psig pressure and 750-F total temperature, with extraction for process consumption at 150 and 50 psig. Since the plant load characteristics are favorable, condensing the balance of the throttle flow causes only a minimum of heat loss, and the power generated is essentially byproduct.

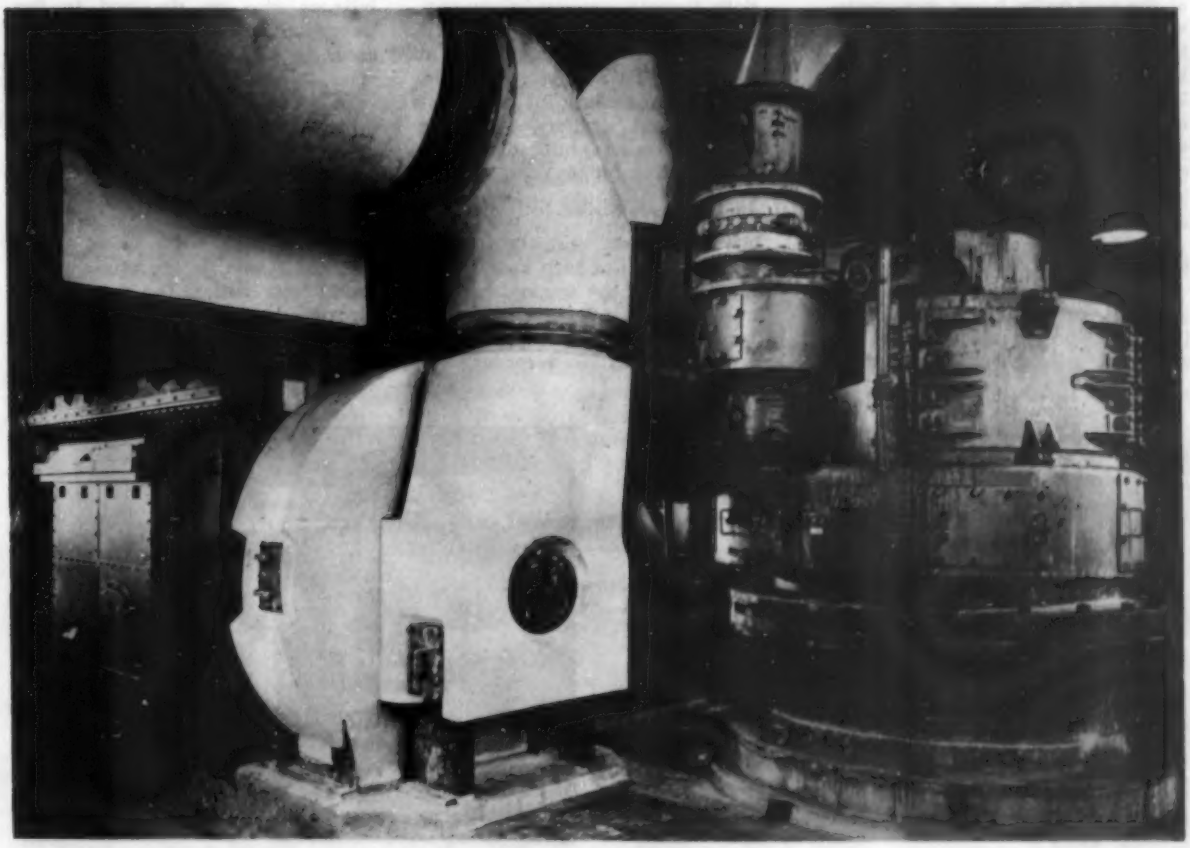
For the final phase of the expansion program the heat balance studies indicated that, with increased electrical demand, a single extraction-noncondensing turbine generator would provide the greatest economy. This unit operates at the same throttle conditions but has only a single extraction point at 150 psig and exhausts at 50 psig back pressure. Assuming actual process steam and electrical demands are within reasonable limits of given quantities, the single extraction-noncondensing unit is base loaded while the double extraction-condensing unit takes the swings in the power demand. A heat balance arrangement of this type normally will provide the most economical means of byproduct power generation and will result in the low power costs so desirable in a highly competitive business enterprise.

Water Treatment

Water supply and treatment were important design factors. Makeup ranges between 30 and 35 percent of the total boiler feed, the raw water coming from Lake Manistee, which is directly adjacent to the mill property. During the initial phase of the project, a complete water treatment system was installed with sufficient capacity to handle 350,000 to 400,000 lb of water per hr. The facilities included: pumps, precipitators, filters, softeners, chemical feeders, and a deaerating heater. However, only one new feed pump was required when the second steam generating unit was installed.

Mill Water System

Paper mill operations of this nature require considerable water, much of which, by necessity, must be wasted. Some of this water, as well as the circulating water from the condenser in the power plant, contains heat which normally is lost. In the heat balance studies, it was indicated that certain economies could be appreciated by mixing the condenser water with the raw water makeup. The pump house at the edge of Lake Manistee is designed with a series of baffles that are arranged so the circulating water can



Each boiler is equipped with two, ball-mill pulverizers and four, combination pulverized coal and heavy fuel oil burners.

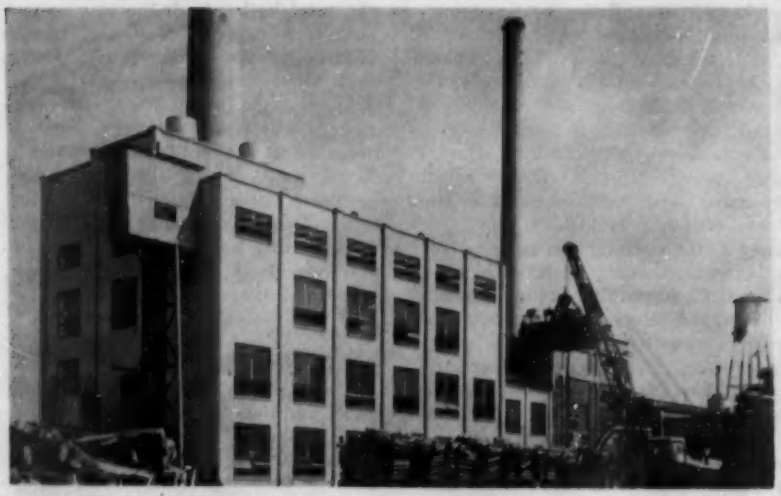


Photo shows the completed boiler plant. Penthouse contains the coal conveyors.

be discharged into the raw water intake chamber, thus reclaiming a large part of the heat.

During the initial phase of the project, adequate space was allowed in the new turbine room for the addition of the second generating unit. Furthermore, the first section of the new boiler house was erected with a temporary wall to permit extension when adding the second boiler. Transite paneling used in this temporary construction was removed when the building was extended and reused for the penthouse in the new section. This penthouse contains the belt conveyor and movable tripper serving the coal storage hoppers.

The permanent boiler house construction is brick and steel, with concrete floors sloped one-quarter inch to the foot to covered floor drain trenches. Numerous windows assure excellent visibility, while steel platforms and stairways, covered with open type grating, provide maximum accessibility for operations and maintenance. Equipment foundations are concrete, the ones for major units such as the turbine generators being supported on concrete filled steel piling.

Both turbine generators operate at 3600 rpm and produce 5000 kw each, power being generated at 2400/4160 volts, 3 phase, 60 cycle. Auxiliary equipment includes: direct connected exciters, generator surface air coolers, oil coolers, and interconnecting piping.

Turbine Instrumentation

Instrumentation for the second generating unit has been installed on an extension of the original turbine room panel. These facilities include: a three-pen throttle steam pressure, temperature, and flow recorder with flow integrator; a three-pen exhaust steam pressure, temperature, and flow recorder with flow integrator; and a two-pen generator air temperature recorder. In addition, several mercury type thermometers are used at various points in the system.

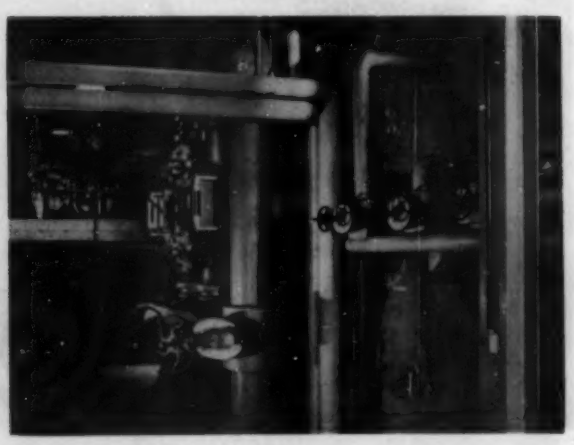
Installation of the back pressure turbine generator required the addition of indoor metal clad switchgear to the original system, sufficient space having been reserved for such extension. Necessary cable, conduit, bus, bus duct, lighting transformers, fixtures, and switchboxes were added in both the boiler house and turbine room. All power wiring is 4160-v primary and 480-v secondary. The plant also uses 120-v, d-c, control wiring for certain operations.

Second Boiler

Anticipated increases in production rates and in other operational functions requiring high pressure steam dictated a size increase when selecting the second boiler over that originally considered. The new boiler unit is rated at 200,000-lb per hr continuous capacity. It is normally fired with pulverized coal using two, ball-mill type coal pulverizers, each of which supply two burners. These burners also are designed to fire heavy industrial fuel oil, thereby increasing the flexibility of the system since full capacity can be obtained with either fuel. Coal for the pulverizers comes from two, new, 150-ton circular bunkers, with 60-degree conical bottoms, that were added to the fuel supply system.

Boiler design pressure is 675 psig with normal operation being at 610 psig-750 F total temperature at the superheater outlet. The unit has an inverted drainable type superheater as well as a two-pass air heater with bypass for low load operation. Me-

Extraction-noncondensing turbine generator foundation.



Condenser for the double extraction turbine generator.

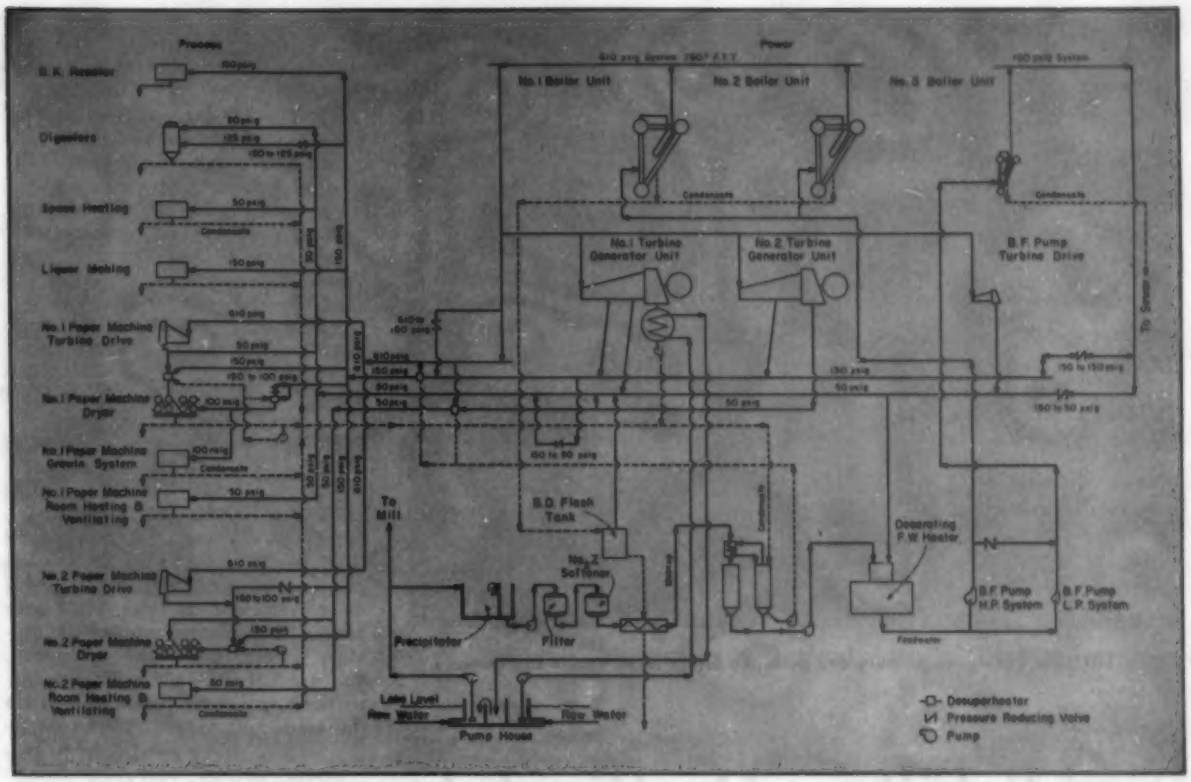


Fig. 1—This flow chart shows power and process steam demands at the American Box Board Company's Filer City Plant.

chanical draft equipment includes: a 300-hp, 875-rpm, motor driven induced draft fan with inlet dampers; a 100-hp, 1200-rpm, motor driven forced draft fan with outlet damper; and a motor driven primary air fan.

Complete combustion controls for automatic operation of the new unit are installed on an extension of the original boiler house panel. Instrumentation consists of: a 10-unit draft gage; a four-pen air and gas temperature recorder; a two-pen boiler water level and steam temperature recorder; a three-pen steam flow, air flow, and steam pressure recorder; and two indicating ammeters. In addition, six, panel-mounted, push-button stations are used for remote control of auxiliary equipment.

Boiler trim includes a 10-in. non-return valve designed for 950 psig-750 F total temperature and extended hand wheel arrangements for the fuel oil and atomizing steam valves. Steam, condensate, blowdown, raw water, boiler feedwater, fuel oil, and compressed air piping all have been extended to accommodate the new unit. Necessary piping also has been installed for the new, turbine driven boiler feed pump which supplies 500 gpm at 785-psig pressure, and for a new, 4000-gpm mill water pump.

Fig. 1 indicates the current heat balance. The boiler listed as No. 5 is one of three remaining units of the former plant. This 25-yr old, 50,000-lb per hr boiler serves as a bark burner, and together with No. 3 and No. 4 units (not shown in Fig. 1) provides standby capacity for normal plant maintenance or emergency operating conditions. With the present system, steam capacity is double and generating capability is four times the ultimate potential of the plant prior to the expansion.

PRINCIPAL EQUIPMENT RECENTLY ADDED TO THE FILER CITY POWER PLANT

Turbine generator	General Electric Co.
Switchgear and substations	General Electric Co.
Desuperheating stations	Republic Flow Meters Co.
Pressure reducing stations	Swartwout Co.
Boiler and superheater	The Babcock & Wilcox Co.
Air preheater	The Babcock & Wilcox Co.
Pulverizers and burners	The Babcock & Wilcox Co.
Soot blowers	Diamond Power Specialty Corp.
FD and ID fans	American Blower Corp.
Coal conveyor	The Fairfield Engineering Co.
Coal scales	Stock Equipment Co.
Ash handling	United Conveyor Corp.
Boiler feedwater pumps	Worthington Corp.
Boiler feedwater pump drives	General Electric Co.
Boiler feedwater treatment	The Permutit Co.
Continuous blowdown	The Permutit Co.
Combustion controls and instrumentation	Republic Flow Meters Co.
Boiler feedwater regulator	Copes-Vulcan Division
Feed valves	Edward Valves, Inc.
Water column	Diamond Power Specialty Corp.
Safety valves	Manning, Maxwell & Moore, Inc.
Blowoff valves	Edward Valves, Inc.
Plant steam distribution control	Republic Flow Meters Co.
Engineer-contractor	Sumner Sollitt Co.

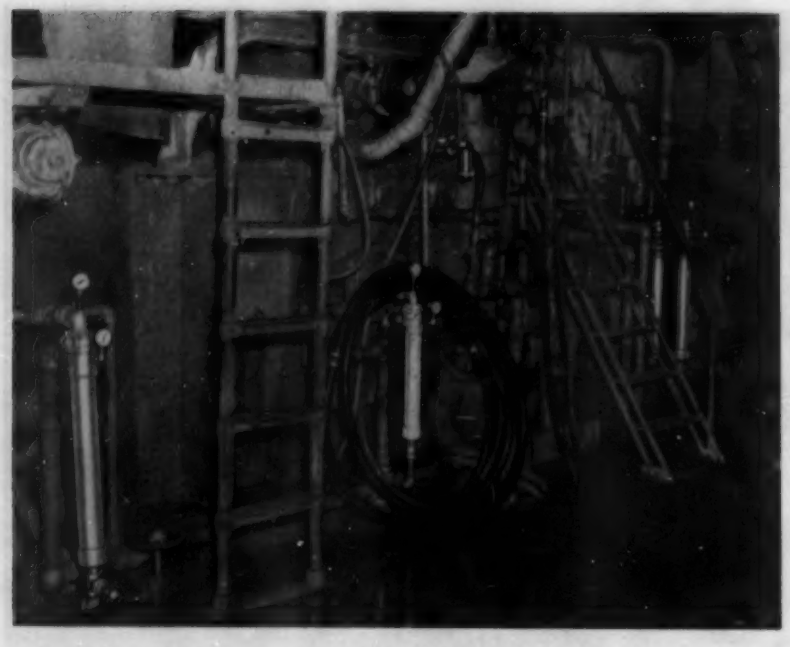


Fig. 1—These Ronningen primary and polishing filters serve oscillating showers.

Small Filters Do Big Job

STAFF REPORT

MANY INDUSTRIAL plants experience difficulties when using deep well water for various wet process operations, especially if the water has a high iron or iron bacteria content. Iron oxidizes readily upon aeration, forming insoluble, rusty-looking, fine particles of Fe_2O_3. In addition, iron-bearing waters favor the growth of iron bacteria, producing a thick, soft, reddish-brown slime that causes clogging of pipelines, valves, and nozzles. This sediment also creates problems by staining everything with which it comes in contact. Water with an iron content of over 0.5 ppm is particularly troublesome.

Iron Removal

Since the iron in deep well waters is almost invariably present as soluble ferrous bicarbonate, its removal usually is effected by: aeration and filtration; filtration preceded by settling; or one of the base exchange processes. Selection of the proper method will depend on the water analysis, flow rate of the system, and end use of the water. In Southern Michigan, numerous mills are obtaining highly successful results by using Ronningen, fine mesh, Monel, wire cloth filters.

Basically, the Ronningen filter is a vertical, duplex unit with the filtering element suspended in a housing. The assembly is quick coupling to permit removal from the line and replacement of the element without tools. The element consists of an outer filtering medium of electrically welded, Monel metal, wire filter cloth mounted on a strengthening inner section of perforated sheet Monel, butt heliarc welded with reinforcing rings. Both ends of the filter element are sealed with Monel metal caps to prevent short-circuiting, a necessity for fine filtration.

Case Histories

Fig. 1 shows an application of two-stage filtration in one Southern Michigan mill. This plant has two, 136-in., single cylinder paper machines (widest trim sheet 120 inches), manufacturing pattern tissue, white wrapping tissue, and tissue specialties. Speeds normally range from 375 to 400 fpm, the weight of paper averaging 8½ to 9 pounds.

Since ferric oxide caused sticking on six large hydraulic valves and plugging of foam killing spray nozzles and Broughton, low volume, high pressure, oscillating showers, various iron removal methods were considered. At first, the mill engineers thought that it might be necessary to install a complete water treatment system, with high initial investment and rather heavy operating costs. However, filtration proved highly effective in spite of the very severe service conditions.

The filtration system consists of primary, duplex, 100 mesh Dutch weave filters, each followed by two, individual, 200 mesh, Monel metal, Dutch weave units. It was found that large particles of iron, rust, pipe scale, and bacterial growth were removed in the 100 mesh (.0055-in. maximum retention), primary filters, while the secondary, 200 mesh (.0033-in. maximum retention), polishing filters picked up the remaining, powdery-like particles. Fig. 2 shows the primary unit.

Under normal operating conditions, this plant changes the element in the primary filter every 8 hours. The substantial amount of iron substance removed during that time is clearly apparent from a comparison of the dirty and clean elements shown in Fig. 3. Because the filter element is electrically welded Monel metal, it can be "soured out" with either 10 percent sulfuric acid-water solution or 10 percent muriatic acid-water solution, and such cleaning requires only a minimum of time and effort. Fig. 4 illustrates one convenient "souring out" procedure.

Coating Mill Installation

A fourplex filter installation in a Kalamazoo mill is shown in Fig. 5. The mill produces machine finish, bond, catalogue, envelope, and various other fine coated paper products, in widths varying from 120 to 144 inches, on five Fourdrinier machines which operate at speeds up to 900 fpm. Individual, 225 gpm, twilled weave, 100 mesh, Monel metal filters are installed in the water lines to the showers, sprays, and trim nozzles, and results have been uniformly successful.

Although the water supply averages 23-grains hardness, some advantage is gained at this mill by using a combination of well and pond water. Satisfactory operation is obtained with a schedule of back-

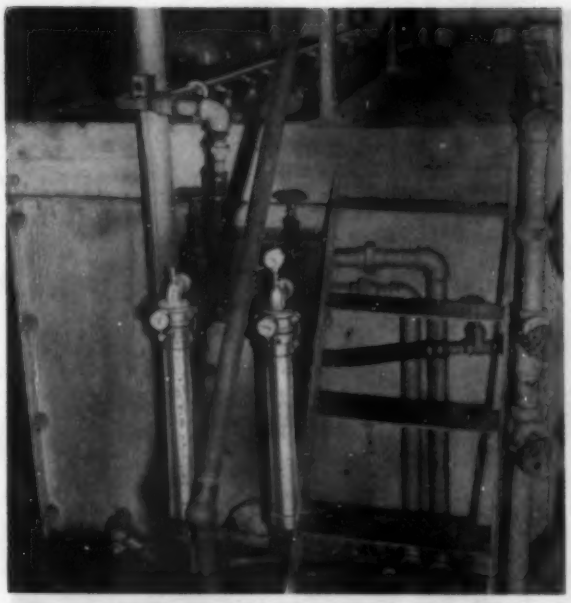


Fig. 2—Primary units with 100-mesh, Monel metal, Dutch weave elements will provide .0055-in. maximum retention.

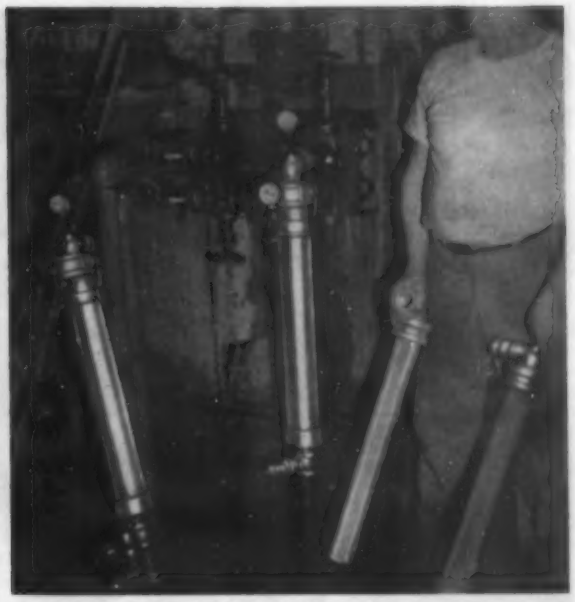


Fig 3—Photo of clean and dirty filter elements shows the substantial amount of iron that has been removed.

washing the filter at normal line pressure every 8 hours and replacing the element once a week. Dirty elements are "soured out."

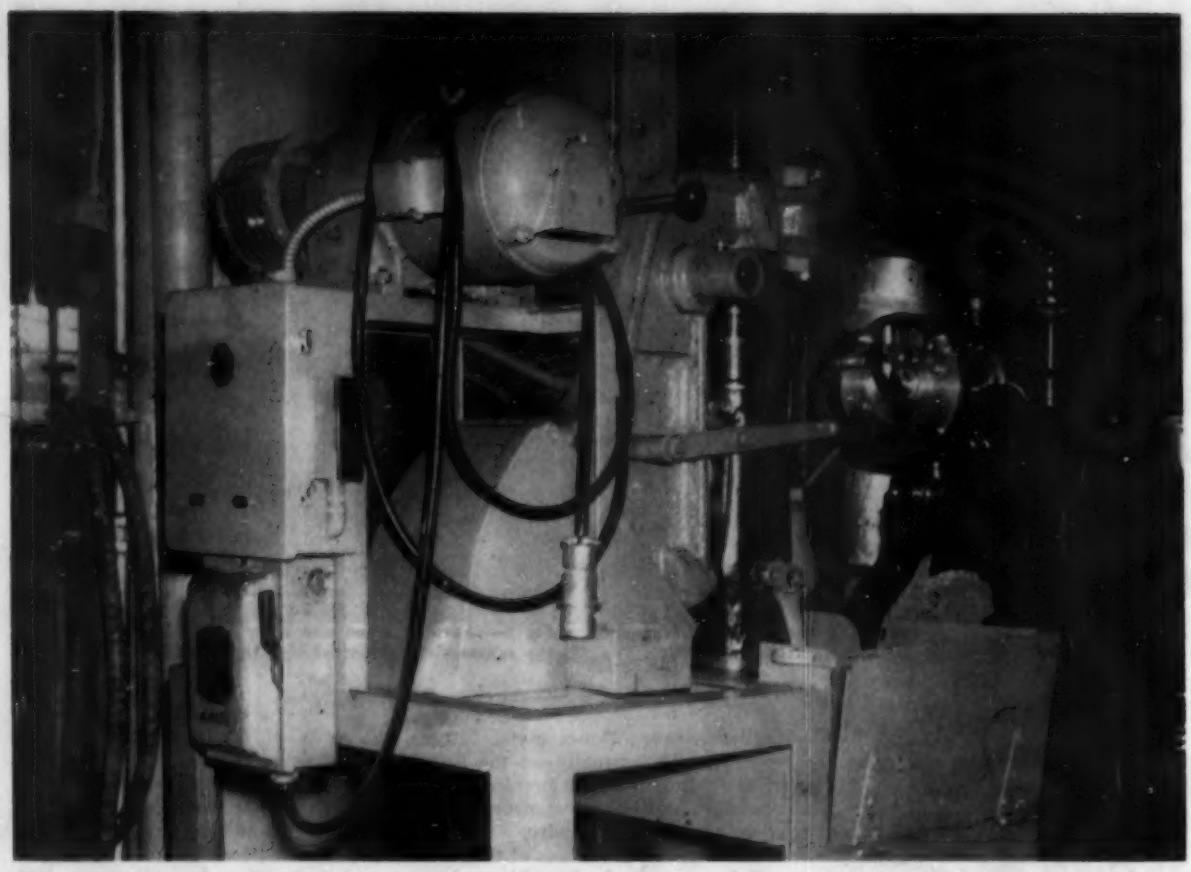
Another Michigan food board and specialty mill with several cylinder machines investigated the use of sodium hexa meta phosphate in an effort to maintain the iron in solution until the water reached the sheet. However, tests indicated this method was not fully effective when the water became aerated, and the annual chemical costs were excessive. Consequently, 100 mesh, twilled weave, Monel metal filters were installed directly on the lines to the Broughton high pressure, low volume, oscillating showers that clean each cylinder wire.

Maintenance schedules at this mill call for periodic backwashing when the inlet and outlet pressure gages show a differential across the element of over 10 psi. Elements are changed twice a week, usually on Monday and Wednesday. This mill, however, does not "sour out" dirty elements, but employs steam cleaning. No difficulties are experienced in spite of the fact that the raw water contains 1.7 ppm of iron and some iron bacteria (Gallionella).

Equally successful results have been reported by numerous other paper mills, food processing plants, and industries depending on wet process operations. The initial investment for filtration is only a fraction of the cost of a complete iron removal treatment plant, and operating costs are less. Rust discoloration and staining are reduced, and elimination of nozzle plugging increases the life of the showers.

Fig. 4—"Souring out" is one convenient procedure for effectively cleaning dirty filter elements.

Fig. 5—Operators examine an iron-coated filtering element. Unit is part of a fourplex installation in a Kalamazoo mill.



This machine had been operated from an overhead line shaft; it is now equipped with a drive unit, gear shift, and reversing starter permitting four speeds forward and four speeds reverse. Plug-in cord allows machine to be moved.

Remotoring an Industrial Plant

MURPHY SHELL
Manager — Electrical Engineering
Parke, Davis & Company

I&P EXCLUSIVE

THE PROBLEM of remotoring at Parke, Davis & Company began a few years ago when the engineering division obtained approval to change the Detroit plant's electrical supply from the isolated d-c source within the plant to an a-c source from The Detroit Edison Company. The remotoring program assumed tremendous proportions considering the thousands of motors in a plant so large and old as Parke-Davis'; there are little 120-w mixer and agitator motors and up to 150-hp compressor motors, with all sizes and speeds in between. The 120-v, d-c service to every one of these motors will eventually be replaced with 60-cps, a-c service.

Special Drives

Throughout the plant there are hundreds of special drives; there are production equipment and line operations powered by variable-speed, d-c motors. There are odd-size and odd-speed d-c gearmotors, some of which are multiple head. There are mills and other pieces of equipment having two or more parts driven by a single d-c motor through a system of belts, pulleys, chains, and gears. There are more than 25 elevators in the plant which are operated from the 120-v, d-c system.

All of the existing d-c motors, regardless of size, are operated from a two-wire, 120-v, d-c supply. There is a limited advantage to a system of this sort in that all motors have identical voltage ratings and can be operated anywhere in the plant, so long as the d-c system in the area has enough capacity available. This voltage rating has been widely used for portable equipment; it is not uncommon to have 1-hp or 1½-hp motor loads operating on 15-a receptacle circuits at 120 v, d-c.

The 60-cps, a-c system will be a combination of 120-v, single-phase, for lighting and small motors, plus 480-v, three-phase for power and large motors. However, there are a few isolated instances where large motors, up to 5 hp, will operate

from a single-phase source because they are located in areas that do not have three-phase distribution circuits near at hand.

Dividing Line

Generally speaking, the ½-hp motor is the dividing line between single-phase and three-phase operation; ½-hp motors or less on portable equipment are run from single-phase while ¾-hp or larger portable devices are operated three-phase. On permanently installed equipment, motors smaller than ½-hp are single-phase while ½-hp or larger are three-phase. Some of the reason behind these decisions are that (for motors rated ½-hp or less at 120 v) motors and controls are less expensive in single-phase than in three-phase; single-phase motors are more readily available than three-phase motors in this range.

For portable equipment of ½-hp or less, at 120 v, single-phase receptacle circuits are more common and less expensive than three-phase receptacle circuits; hence, there is greater probability of having a receptacle in the areas where the portable equipment is to be used. Generally speaking, a 15-a, 120-v, receptacle circuit will handle ½-hp loads and eliminate the need of special receptacle circuits.

Single-phase starting equipment is smaller than three-phase starting equipment; therefore, single-phase power is more adaptable to small, portable equipment.

Larger Motors

Considering motors at 480 v, three-phase, it was found that three-phase motors larger than ¾ hp are less expensive per horsepower than single-phase motors though costs are comparable for ½ hp and ¾ hp motors. The large, three-phase motors require less maintenance than do comparable single-phase motors; three-phase motors are more efficient than single-phase motors and this characteristic is more important on large motors. Portable equipment motors in the larger ratings would require special receptacle circuits for operation on 120 v.

The 480-v, three-phase circuit has more capacity and can accommodate more and larger motors. The physical dimensions of three-phase motors are smaller than those of comparable single-phase motors and are more readily adapted to heavy-duty portable equipment.

The ½-hp Motor

Motors rated ½ hp posed the question: three-phase or single-phase? For permanently installed equipment with ½-hp motors, three-phase operation was selected for the following reasons: several motors of this size, or slightly larger, can be connected to the same branch circuit; the lower maintenance of three-phase motors is more important since this equipment cannot be moved to the shop for repairs; depending upon the floor area served and the capacity of lighting transformers, motors of this size may represent a sizeable demand on the single-phase system; because Parke-Davis receives energy from Detroit Edison at 4800 v and transforms to 480 v for plant use, double transformation is required (from 480 v to 120 v) on all single-phase loads. Considering this and other economic factors, the break-even point is pretty close to the ½-hp load level.

Strictly speaking, the power changeover at Parke-Davis was set up for the purpose of converting the plant from d-c operation to a-c operation. It was not intended that this program would be a "cure-all" by which all equipment, machines, and systems would be improved or modernized in one grand sweep; however, certain areas and processes were scheduled to receive more than routine replacement.

Since all d-c systems and equipment are to be replaced with at least comparable a-c units, there are other factors to consider besides motor replacement as such. Some of the more important economic factors to be considered are:

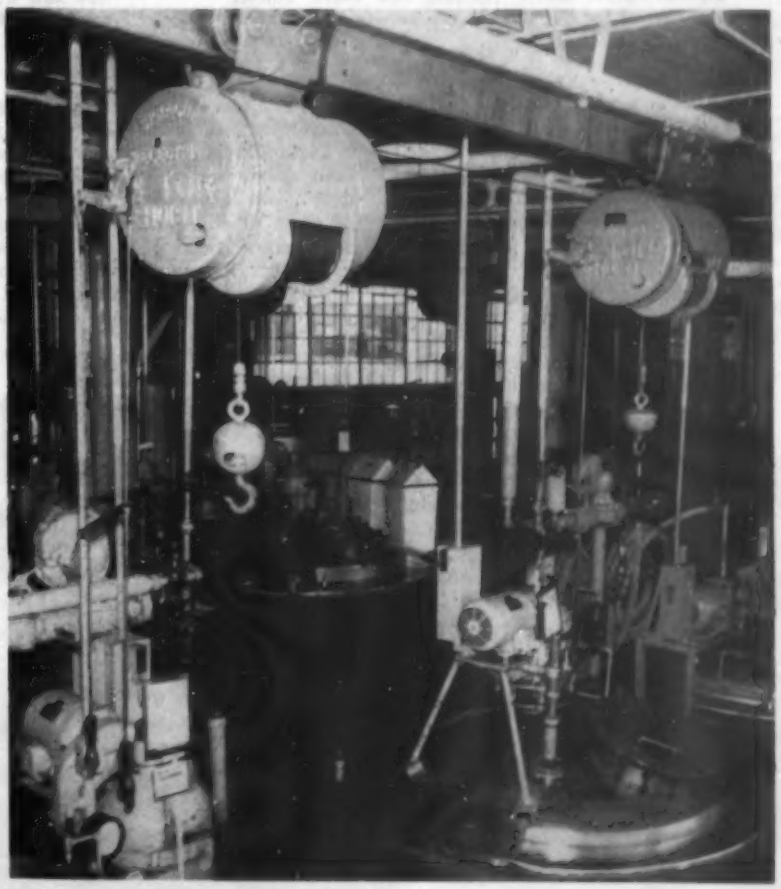
¶Age, condition, and future utility of the equipment.

¶Improvements which are desirable, necessary, or expedient to accompany replacement.

¶Re-use of existing drives, bases, and raceways.

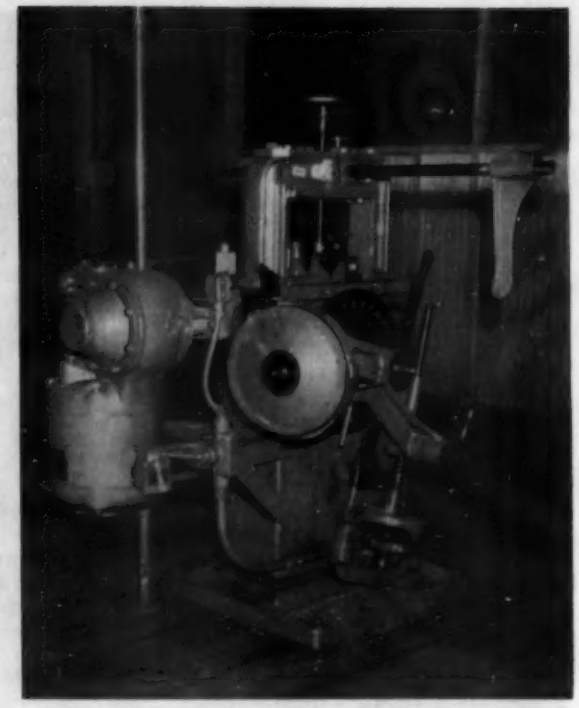
¶Remotoring versus replacing the equipment.

The integration of these four factors determines to a great degree the amount of money that is to be spent on remotoring a particular piece of equipment. Sometimes the



Rectifier to feed d-c to 35-year-old hoist cost $750. Replacing old d-c hoists and trolleys (which were still serviceable) with a-c gear would have cost $4500.

Explosion-proof motor replaces line shaft. Starter and control for this tumbler are outside hazard area.



New saw with a-c drive would have cost $3200. But conversion from line shaft to gearmotor cost $450.

changeover program absorbs the entire cost of remotoring.

Sometimes the operating and production departments are asked to appropriate additional funds to help defray the cost of remotoring certain pieces of equipment. This occurs more frequently when desired improvements or modernizations are beyond the scope of the changeover program.

Typical of these changes are the installing of additional control stations at extended distances, the installing of timers or automatic equipment to replace manual operation, relocating which requires excessive installation changes or improvements, or making machine changes which call for more or larger and special interlocking controls.

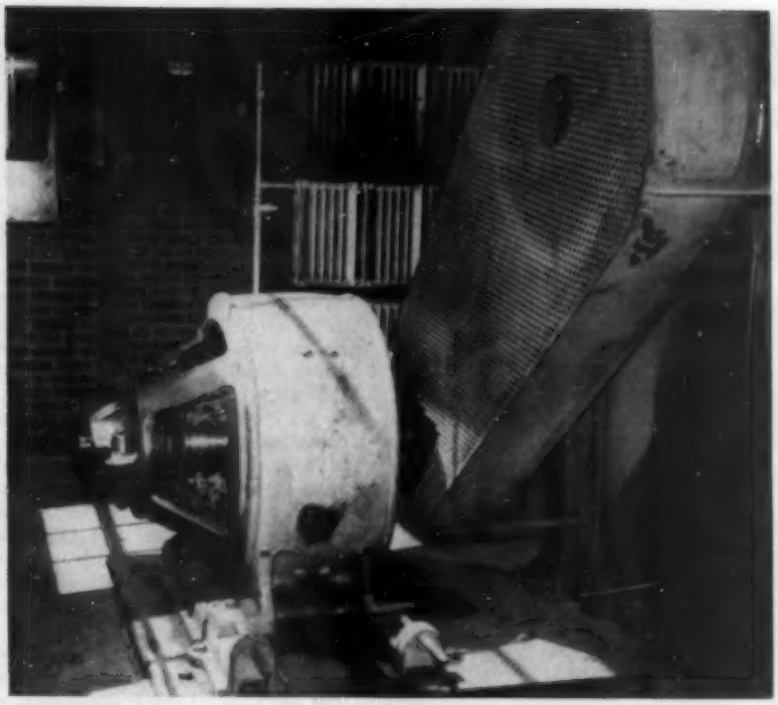
Old Equipment

The condition of the existing equipment is also evaluated before conversion is made. If a machine is old and/or near the end of its useful life, or is a type seldom used, only a minimum of expense is allowed to effect conversion. Certainly, it is a waste of funds to indulge in an elaborate conversion installation on a worn out piece of equipment when conversion will never pay for itself.

Parke-Davis has been in business many years and still retains a great deal of old equipment; the condition of some of this equipment is such that several years of service can be expected. However, other pieces of equipment are beyond economic salvage or repair and in these cases the machine is replaced with a modern one. Here again, the d-c to a-c changeover program may or may not stand the expense of the new item. In some cases, the operating departments will secure an appropriation for part of the cost of the new machine while the changeover program will absorb the remaining cost.

Another economic factor to con-

Starter racks, duct, and conduit used with d-c system were reused for the new a-c power equipment.



Problem here is to replace 30-hp, d-c motor driving ventilating fan with a-c motor-drive combination having safe torque limit for high fan inertia.

sider is the extent to which the existing drives, raceways, and so forth, can be re-used. In most cases, the a-c motor is smaller than the d-c motor to be replaced and can easily be installed. Usually an adapter plate or a set of shim blocks are all that is necessary.

The use of existing raceways is also considered, especially when several motors are concentrated in one area and all the starting equipment is grouped on a wall or panel. The starters are replaced, a few minor changes are made at the motor end of the conduit system, a new feed is installed, and the conduit system is ready for re-use. Of course, the old conductors are removed and new 600-v, insulated conductors are pulled in. Generally speaking, these conduit systems are more than adequate because a three-phase, 480-v motor requires much less copper than does a 120-v, d-c motor of the same capacity.

Re-Using Drives

The re-use of existing drives is a tougher problem. Quite often, d-c motors operate at odd speeds that cannot be duplicated with a-c motors. This problem can be resolved on belt-driven equipment by changing one or more pulleys. On direct-drive equipment more investigation is required: can the machine stand an increase or decrease in speed so as to use standard a-c motors; if not, does its continued use justify the expense of special gearmotors or other drives? These questions must be handled on an individual basis.

After the decision is reached to remotor a piece of equipment, it must be investigated to determine duty cycle, power and torque requirements, and the type of enclosure for the a-c replacement motor that is to be substituted for the d-c.

Name Plates

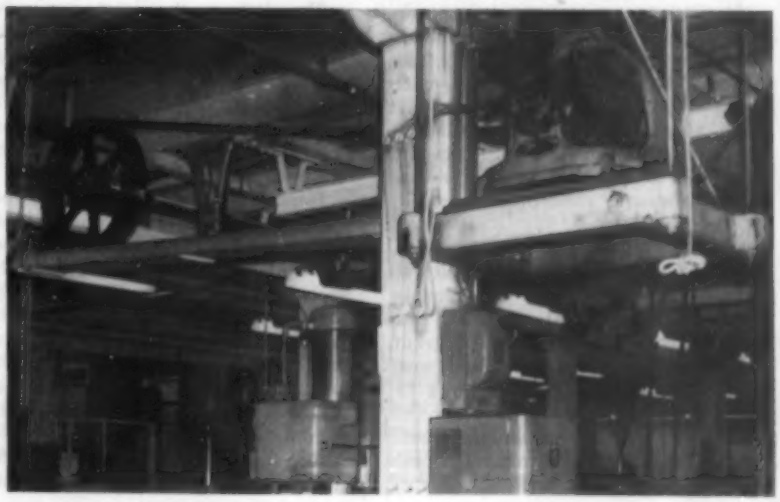
It soon became obvious, near the beginning of the remotoring program, that the name-plate data of the existing d-c motors could not be entirely depended upon. There were several installations where the d-c motor was operating at other than rated load or rated speed. Remotoring from name-plate data often caused undue confusion, and added downtime.

A few years ago, Parke-Davis embarked upon a plant-wide preventive maintenance program; here was a source of information which was more reliable than the motor name plate. Among other things, the electricians assigned to preventive maintenance have a record of the operating data of all motors—a-c and d-c. This maintenance data has eliminated a great deal of guesswork in the replacement of d-c motors that have failed before complete in-service operating data could be obtained.

Motor Torque

Generally speaking, most three-phase motor installations are NEMA design B, with normal starting torque. However, there are many applications requiring the use of high-slip, high-torque motors to drive compressors, presses, and conveyors. These motors, NEMA design C and D, develop higher starting torques than does NEMA design B and are used very successfully.

The wound-rotor motor is a ma-



Overhead line shaft with d-c drive will be replaced by individual a-c drives for each machine.

chine that can provide variable torque for starting and for running duty. Although this motor and its controls are quite expensive compared to a squirrel-cage induction motor, it has very definite advantages in certain applications. So far at Parke-Davis, one conversion has been made using a 50-hp wound-rotor motor; there may be more such installations in the future. This motor drives an older type of refrigeration compressor; there is also a 25-hp induction motor driving a smaller compressor which is tied into the same refrigeration system. These units do not have unloader valves.

The base load of the system is handled by the larger unit; the speed and maximum load on the large compressor are varied by means of the wound-rotor motor and its controller. The smaller unit is allowed to cycle; it handles variations and peaks in the refrigeration load. As seasons and temperature conditions change during the year, the base load is adjusted by adjusting the speed of the large compressor unit.

Enclosures

The enclosure must also be considered for the replacement motors. A pharmaceutical plant has need of just about every type of enclosure available. There are areas in the chemical departments which require hazardous area equipment approved for Class I, Group D installations. Benzene, alcohol, acetone, and similar liquids are very common in these areas and every precaution must be observed in order to insure that safe installations are made.

The granulating, mixing, and compressing sections within the pill and tablet departments are inherently quite dusty and require totally enclosed motors. Other areas that require frequent hosing down during cleaning operations require splash-proof or totally enclosed motors. There are many motors driving fans, compressors, conveyors, and so on in normal atmospheric conditions that are adequately served with open-type enclosures. These motors are the least expensive type and they are used wherever conditions permit.

Special Problems

In a plant as large and complex as Parke-Davis', there are literally hundreds of special problems that arise during a remotoring program. Some of these special problems are:
¶One- or two-speed a-c motors for elevators; some elevators were left on d-c operation and supplied with local m-g sets to provide smooth control and better leveling.
¶Reduced-voltage starting to reduce the starting shock on large multiple-head grinders in the general maintenance shops.
¶Two-speed motors for ventilation fans for summer or winter operation.
¶Split-phase motors using variable reactors for variable speed duty on small machines.

Rectifiers

There are many installations about the plant that use special d-c motors which are difficult and costly to replace with a-c motors. Some of this equipment would be very expensive if replaced with a newer, a-c model. Where the condition of the special equipment is such that many years of service can be expected, rectifiers are provided, and the original d-c equipment left intact. This results in a more rapid and less expensive conversion program.

In many cases, the dc provides better operation than would be available with ac; this is especially true in the matter of speed control and torque variation.

Replacing Drives

The replacement of the drives on equipment has required a great deal of investigation. This problem is significant in view of the fact that much of the equipment had been operating with variable-speed, d-c motors or has been driven from overhead line shafts.

In the solution of the variable-speed problem, the following three categorical solutions have covered most situations:
¶Standard speed a-c motors and the use of variable-pitch pulleys.
¶Variable speed units which combine the motor and variable-pitch pulleys as an integral unit.
¶The use of rectifiers to supply d-c to the original d-c motor.

The last is the least expensive method because the existing motor and drive do not have to be disturbed; however, this system is not used extensively because much of the existing equipment is quite old and about due for major overhaul and repairs anyway.

Generally speaking, the first alternative is less expensive for machines that are belt-driven; it uses more standard parts than does the second alternative. However, the first alternative requires that the motor be mounted on a sliding base and quite often the adjusting mechanism is in an inconvenient location.

If the machine was directly connected to its variable-speed d-c motor, the second alternative is quite often chosen for its compactness and ease of installation. There is no hard and fast rule for the solution of these problems and each has to be investigated for its own merits.

Shafting

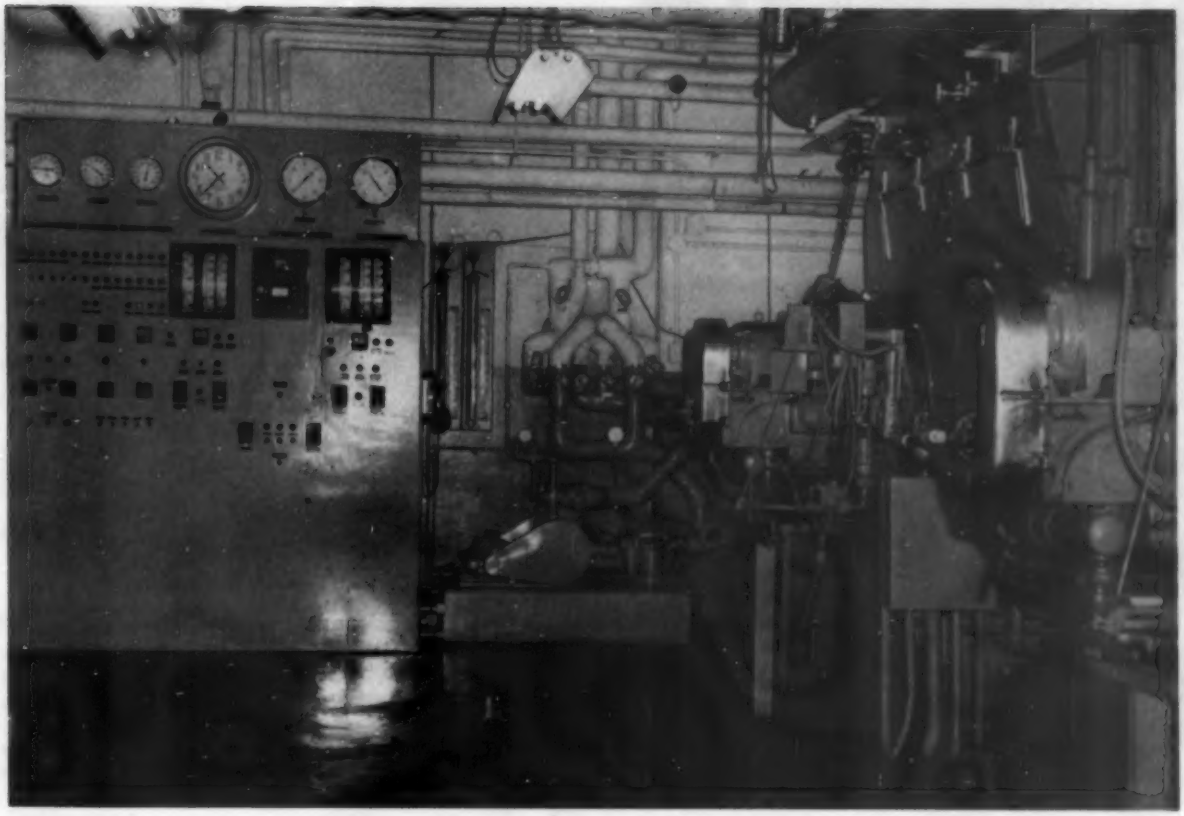
The replacement of line shaft has required many hours of engineering time in the design of motor mounts and types of drives. In many cases, the V-flat drive has been used on machines which had large pulleys driven by flat belts. This type of drive saved the expense of the large pulley and maintained the flywheel effect which is an important consideration for pulsating loads such as punch presses and reciprocating compressors and hammers.

Parke-Davis also has many installations and utilizing gearmotors. This type of motor is expensive, whether it be a-c or d-c. The nature of these installations is such that many of the d-c gearmotors will be replaced with a-c gearmotors. At the present time, installation of a large rectifier unit is being considered to supply d-c to a department that has several machines driven by variable-speed, d-c gearmotors. This conversion will be much less expensive than a complete a-c conversion and the economical variable-speed characteristics of the d-c motors will be maintained.

Another department had a 25-hp, 100-rpm, d-c gearmotor which had to be converted. A new a-c unit would have cost approximately $1100. It was found that the gears and casing were in good condition; the unit was shipped to the manufacturer who adapted a 480-v, a-c, three-phase motor to the unit for approximately $750. This is typical of some of the economies that can be effected during a plant-wide remotoring program.

In the over-all picture of remotoring, the mechanical problem of drive replacement requires much more engineering and design than does the electrical problem of deciding upon proper motors and controls, once the distribution system has been designed and installed.

In earlier days, direct current and line-shaft-operated equipment was everyday practice. In those days, Parke-Davis was expanding and built its plant around these accepted practices. But all this will eventually be brought up to date in the program to change over the plant electrical distribution system from dc to ac. Some of the problems are proving to be fairly simple and straightforward. Others require much investigation to arrive at a satisfactory and economical solution.



The panel is located in the plant boiler room, and while it does not replace operators, it does simplify their work.

Centralized Panel Board Controls Plant Facilities

CHARLES N. DEBES
Charles N. Debes & Associates
Consulting Engineers
Rockford, Illinois

I&P EXCLUSIVE

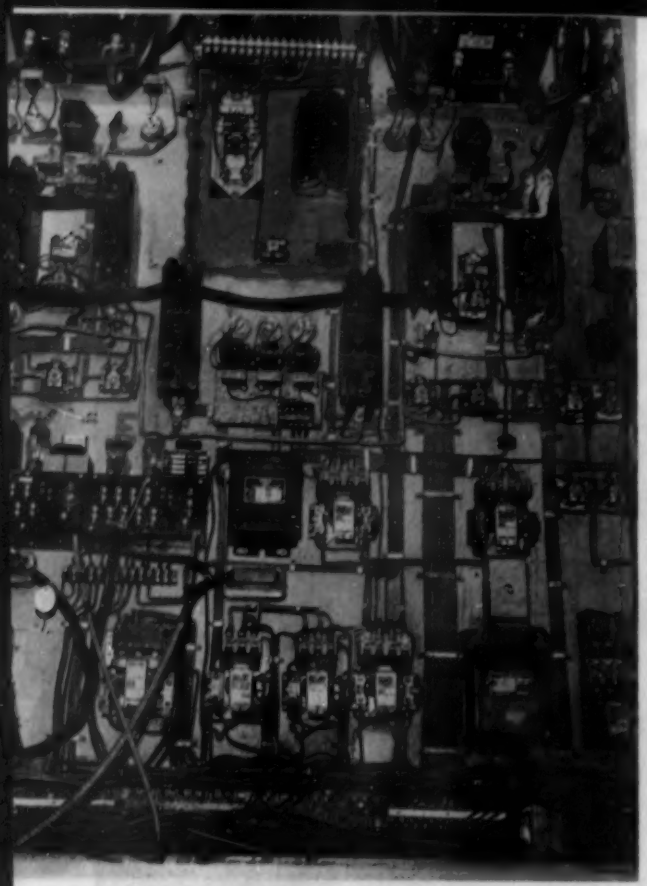
In the interests of safely and more efficient operation of various plant facilities, the Woodward Governor Co. built a control panel that permits operation of all important utilities from one central location.

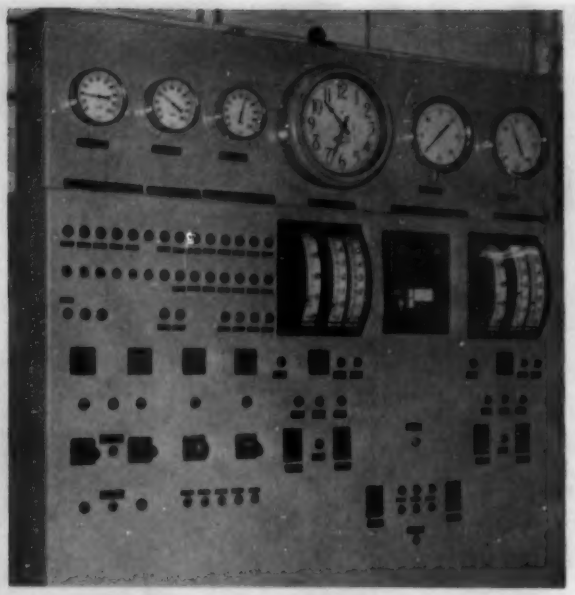
SHORTLY AFTER the new plant of the Woodward Governor Co. in Rockford, Illinois was constructed in 1940-41, operational difficulty was encountered because of the complexity of knowing whether all the air-conditioning and exhaust equipment was in operation throughout the plant, especially after power interruptions.

Power Interruptions

After each momentary power failure, or in some instances after a severe voltage dip, some or all of the fans and air-conditioning equipment would drop out. Considerable time might elapse before it was evident that the air-conditioning equipment was not functioning properly.

From the standpoint of fire protection, too, it was desirable to be able to control the air-conditioning and exhaust fans in the building from one central point. It was also a decided operating advantage to have





All panel controls and indicators are clearly marked and neatly laid out for complete ease of operation.

A rear view shows the complexity of the wiring, yet the ready accessibility for trouble shooting work.

a central location where the functioning of the various auxiliary equipment could be controlled and checked.

Equipment Location

The plant, being of a windowless construction, is entirely air-conditioned with temperature and humidity control throughout both the manufacturing and office areas. There are four major fan rooms, each of which is operated entirely independent of the other. Each fan room contains fans, pumps, electrostatic filters, kathabar dehumidification units, and auxiliary equipment, the malfunctioning of which would disturb the quality of the air-conditioning.

Control Panel

A central control panel was constructed, and, for the convenience of operation and maintenance, was located in the plant boiler room. Among its other features, the panel has an automatic reset for automatically restarting any ventilation and air-conditioning equipment after power dips or a power failure. Immediately after the restoration of power, three impulses, timed a few seconds apart, initiate a chain reaction in the local fan room control relay boxes. The unique feature of this system is that only four wires are required for each fan room. By means of control relays in each fan room, it is possible to utilize these four wires to perform the following functions:

1. Continuous monitoring of all equipment. Upon failure of any one item of equipment or the operation of any safety device — such as a high or low limit thermostat, an alarm is transmitted to the panel in the boiler room.

2. Reset impulses are automatically initiated from the panel to restore, if possible, the equipment to working order.

3. If three impulses fail to reset the equipment, a main alarm is sounded in the boiler room and an annunciator light flashes to indicate the trouble area.

Operating Continuity

Continuity of operation of all plant facilities was the major consideration in the design of the control panel. Thus, for all major pieces of equipment that have automatic safety features an easy means is available for by-passing the safety controls if it is found to be absolutely essential in order to maintain operations.

For example, in the control of the oil burner there are various limit switches that operate at different times; such as low fire position switch, damper limit switch, high water limit float switch, low water limit float switch, pressure switch, vaporstat air switch, and combustion controls consisting of a flame rod and photo cell.

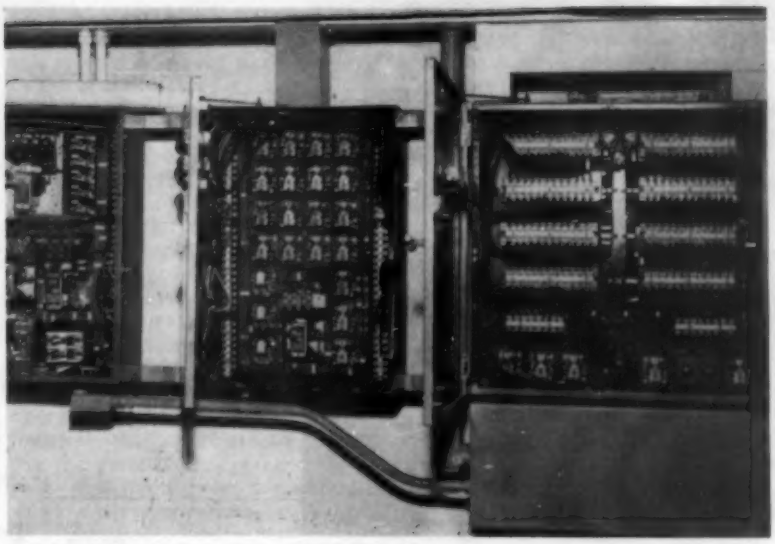
During a normal starting cycle there are a number of safety limit switches that have to operate before the oil solenoid valve will open. Each boiler has five pilot lights indicating in sequence whether the various safety switches have closed. In the event that one switch fails to close, the operator can note the point at which the cycle stopped and quickly determine which of the safety interlocks have failed to function.

Energized Circuit

All relay and alarm circuits are "continuously energized" so that when any alarm relay, contact, or wire, fails, a power failure alarm is indicated. With this system of "chain" relay operation, it is feasible to have as many as 30 to 40 alarm functions all operating on the same four wires. Each relay and its respective function is continually monitored.

Equipment directly controlled from the central panel is:

1. All ventilation and process ex-



Automatic control circuits and relays in one of the air-conditioning rooms.

haust fans in the building. These may be shut down either individually or as a group.

2. The controls for two wells providing water for process and air-conditioning use.

3. Booster pumps for raising the domestic water system pressure.

4. A "black out" button to extinguish all exterior plant lights in the event of an air raid emergency.

5. Complete boiler controls, including ignition, circulating pumps, condensate pumps, hydraulic damper control pump unit.

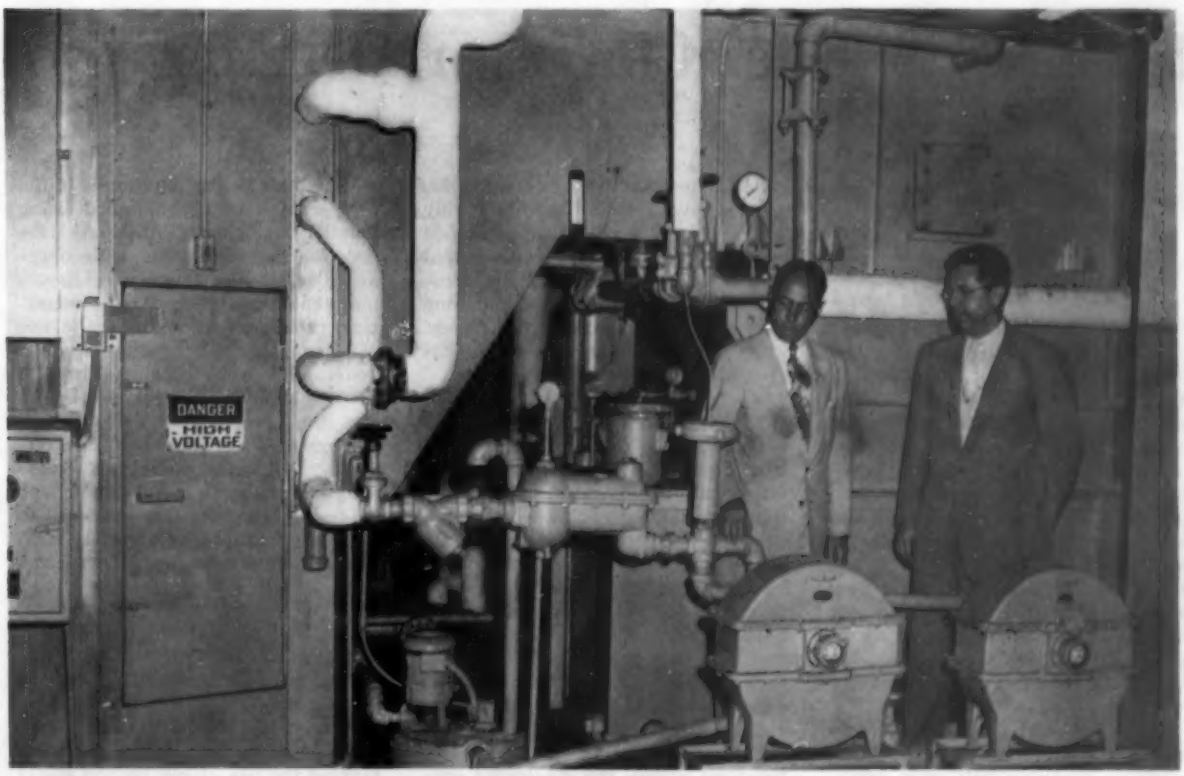
6. Controls for the air compressors with automatic provisions for alternating their operation.

7. Time meters that give total time of operation on such units as booster pumps, air compressors, and boilers. This allows a simple check to equalize the wear on different items of equipment.

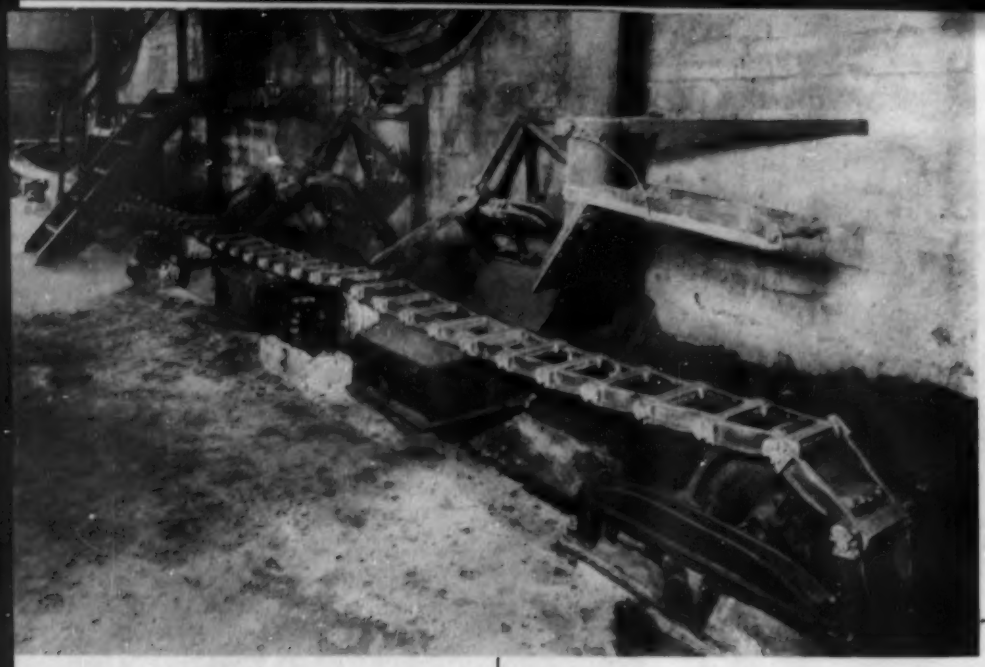
8. There are, in addition, 16 alarm relays and annunciator lamp indication for such controls as sprinkler alarm, high air pressure, low steam pressure, sump pump failure, power failure, circuit breaker failure, low water pressure, etc.

Maintenance

The entire system of annunciators and controls is maintained in perfect working order by continual testing of the circuits. In the event that a failure occurs anywhere in the building on an important unit, an indication is immedately transmitted to the panel and steps are taken automatically to clear the trouble, if possible. This type of automatic indication and control in no way replaces operators or reduces the necessity for vigilance. It does, however, simplify the work of the operator and makes him more efficient.

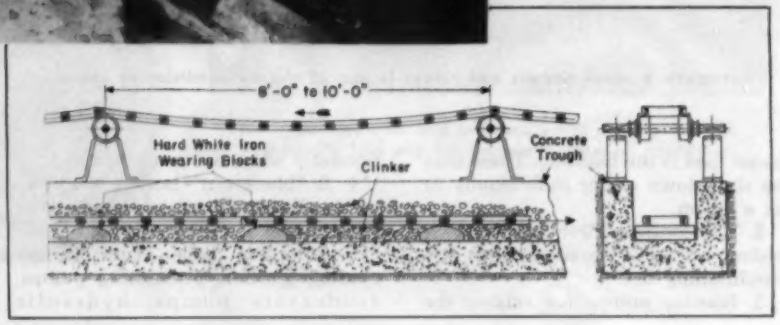


Delbert Zeigler (left), plant engineer at Woodward, discusses the fresh air intake control equipment with the author.



I&P EXCLUSIVE

Drag chain conveyors, such as the above hot clinker and clinker dust handling unit, offer the construction shown in the detail drawing at right.



Hot Materials Demand Special Conveyor Designs

C. A. HOYA, Engineer
Chain Belt Company

PRESENT-DAY PROCESSES, such as calcining, sintering, briquetting, nodulizing, and beneficiation, have created an increasing demand for the handling of large volumes of hot bulk materials. For temperatures under 400 F (approximately 200 C), many types of conveyors are available, including apron and pan conveyors, drag chain conveyors, vibrating and shaker conveyors, and conveyors equipped with steel belts or special constructions of rubber belts. When temperatures are well above 400 F, the choice of conveyors is limited to a relatively few types.

The selection of 400 F as the dividing line is purely arbitrary, inasmuch as conveyor belting is available in special constructions suitable for temperatures exceeding 400 F. However, when the relatively short life of such belts, combined with the cost of their replacement and attendant down time, is compared with the reliability and long service life of properly designed steel units, there is little doubt that special belts are more expensive.

Service Classifications

Handling of hot bulk materials can be divided into two general classifications: those in which the material is to be cooled while being handled, and those in which the process requires retention of all heat and its maintenance within a given range. Applications where cooling is incidental to, or part of, the handling process are the most common—for example, following the completion of sintering, roasting, calcining, or refining.

For a typical cooling-during-handling system the conveying medium must have a construction that will withstand the maximum initial temperature of the material being handled, efficiently dissipate the heat, and provide dependable operation and long life with minimum maintenance. Under certain conditions, this may necessitate the use of alloys although excellent results generally can be obtained through the use of normal carbon steels and cast irons, properly applied and proportioned. Wire-mesh belts are obviously not suitable for bulk materials containing a large percentage of fines, but they are utilized in high-temperature operations, such as carrying glassware through lehrs.

Drag Chain Conveyors

The earliest and simplest type of conveyor for handling very hot materials is the cast steel, drag chain conveyor—still used widely for handling hot cement clinker. Its chain links are rugged and massive, making the use of low carbon steels entirely suitable. The pins, however,

must be made of alloy steel. Being of simple and rugged contruction, this type of conveyor is readily capable of withstanding high initial temperatures, even though the chain is operating buried in the material.

Drag chain conveyors have advantages and limitations. Although the efficiency of heat transfer is relatively poor, the life of these conveyors is reasonably long, and they require but little servicing. However, drag chain conveyors are limited in capacity and are adaptable largely to horizontal runs or runs of low inclination. The chain's great weight plus the fact that the chain operates at the temperature of the material—the latter condition reducing the permissible operating chain pull—also limits them to relatively short center applications.

Cast Pan Conveyors

Cast pan conveyors also are used for handling hot materials. This type of unit can withstand maximum initial temperatures because the cast pans, which are made of either cast iron or malleable iron, are of very generous proportions. It also provides efficient heat transfer for cooling. Because the double-strand chain operates with rolling friction instead of sliding friction and is outside of the maximum temperature zone, thereby contributing to the permissible operating chain pull, long centers are possible. Operation on inclines is entirely practical.

Conveyors of the cast pan type often find application in the casting of various metal pigs—iron and aluminum. Since this service involves very high initial temperatures, water is sprayed on the return run to accelerate heat transfer and to overcome the build-up of residual heat in the heavy cast pans.

Improved Pan Conveyors

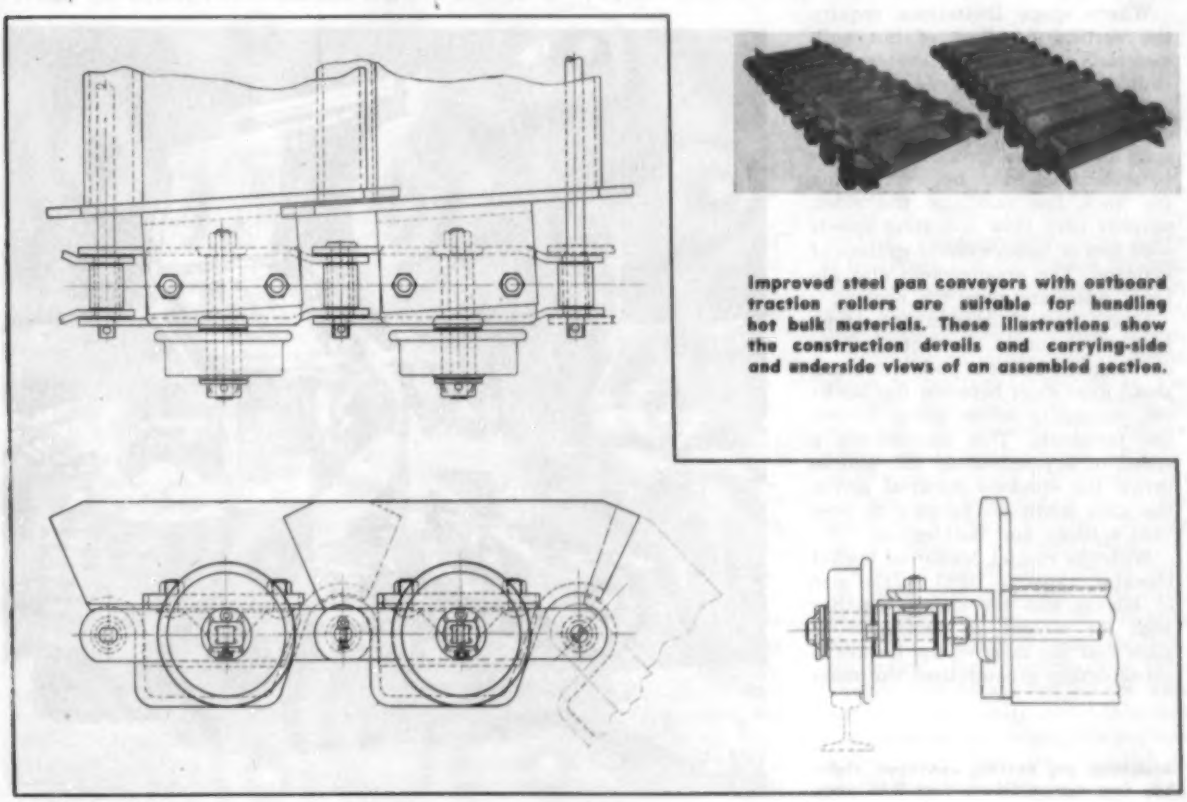
One improved type of pan conveyor is the outboard-roller steel pan conveyor, in which formed steel pans replace the heavy cast pans. This design not only provides high rates of heat transfer but is a very efficient conveying medium. Power requirements are relatively low because of the large-diameter carrying rollers, while the shape of the pans makes this design suitable for handling material being carried up steep inclines.

Conveyor capacity—that is, the size of pan and the speed, together with the weight of steel used—is such that the mass of the carrying pan (dead load) is considerably greater than the mass of the live load of hot material. This ratio approximates 2 or 3 to 1 for peak-load conditions. Thus, maximum initial temperatures are accommodated easily, and any localization of intense heat presents no problem.

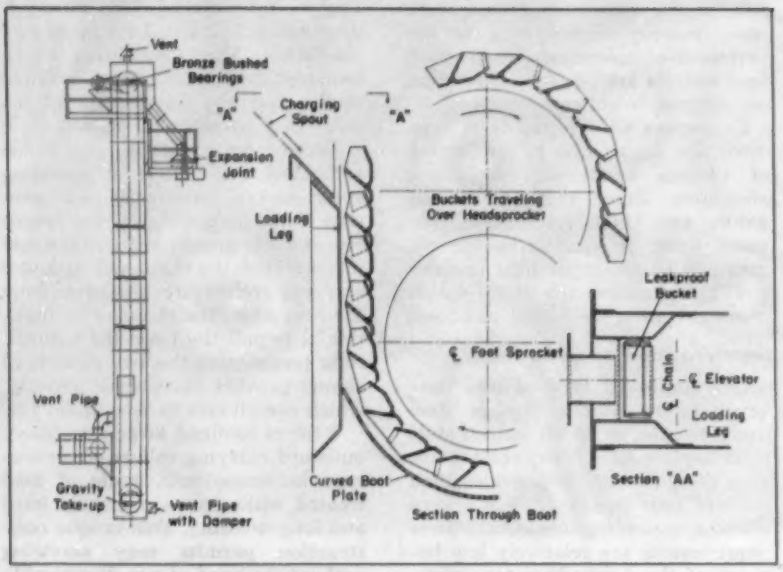
Careful design of the pan shape combined with the low operating speed—approximately 50 fpm—permits complete cooling on the return run and also greatly reduces the rate of wear. Both the chain and outboard carrying rollers are insulated from the heat zone. The chain's sole function is to pull the load; the through rods (connecting the two strands of chain) provide exceptional rigidity, which contributes to long chain life.

Wear is confined largely to heavy outboard carrying rollers on sleeve-type bushings, both made of heat treated white iron—extremely hard and long-wearing. This unique construction permits easy servicing without the need of any disassembly of the chain or conveyor. Individual servicing or replacement of carrying rollers, bushings, or even pans, can be done without disturbing the chain or remainder of the conveyor.

Lubrication is simple. The application of graphite in a suitable vehicle, such as kerosene (which quickly evaporates), is all that is required. Antifriction bearings are



Improved steel pan conveyors with outboard traction rollers are suitable for handling hot bulk materials. These illustrations show the construction details and carrying-side and underside views of an assembled section.



This drawing shows design details of the special leakproof bucket elevator.

not practical in the outboard rollers because of the difficulty of installing and maintaining the seals. Further, it is difficult to retain conventional lubricants in antifriction bearings at the temperatures encountered on most projects.

Leakproof Bucket Elevators

Where space limitations require the vertical handling of hot bulk materials, a bucket elevator that embodies the same general design characteristics as the improved pan conveyor can provide effective results. Modern leakproof bucket construction, obtained by overlapping the back lips and also the sides, permits very slow operating speeds —60 fpm or less—without spillage of material. The arrangement also affords adequate time for cooling.

Most typical continuous type bucket elevators do not include overlapping buckets and, therefore, small gaps exist between the buckets, especially when going around the terminals. This necessitates a speed of approximately 125 fpm to throw the elevated material across the gaps when discharging to prevent spillage and backlegging.

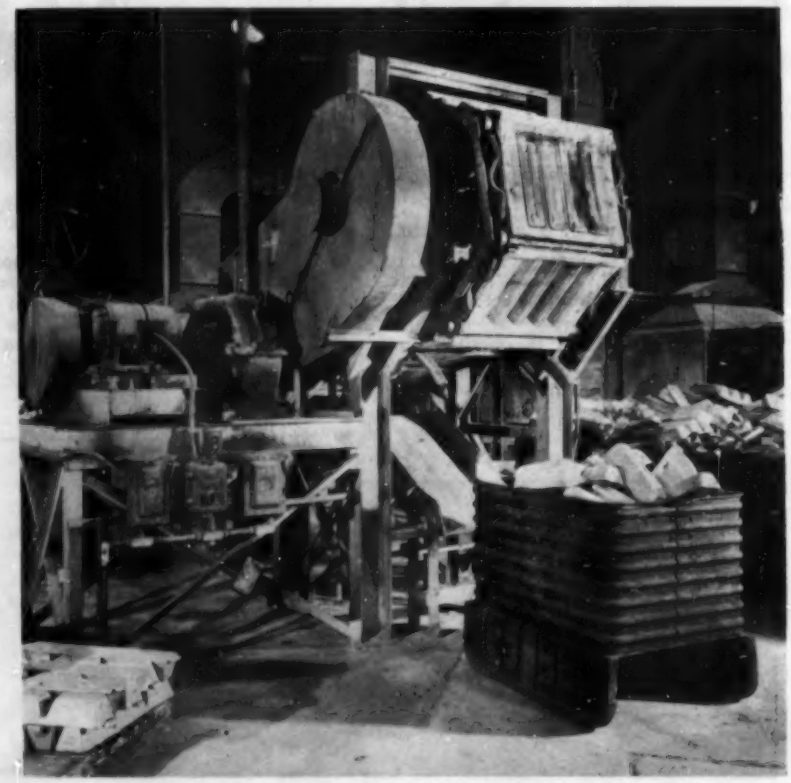
With the special, leakproof bucket elevator, capacity—that is, the size of bucket and the speed, together with the weight of steel used—is such that the mass of the bucket is considerably greater than the mass of the live load being elevated. This ratio should be a minimum of approximately 3 or 4 to 1 for peak-load conditions. It should be noted that the ratio of mass of carrying medium to mass of load is greater for the bucket elevator than for the pan conveyor, because the elevator casing confines the heat, making cooling more difficult. Also, the elevator chain is not as well protected from the maximum heat zone.

However, the shape of the buckets, with their extended backs and sides, provides maximum surface area for cooling, while the low operating speed—approximately 50 fpm—permits efficient heat dissipation on the return run and greatly reduces wear. The chain is at least partly insulated from the maximum heat zone, and the elevator casing is vented to help release the heat.

Since the buckets are entirely leakproof, the chain stays completely clean, thereby giving long wear with minimum servicing. The unit is a very efficient conveying medium; in fact, it can be used as an accurate volumetric feeder.

General Considerations

In designing conveyors for hot bulk material applications, both the capacity ratings and ratios of live loads to dead loads associated with normal temperature services are discarded. Providing of an efficient heat transfer upsets these usual relationships. With the slow operating speeds of high temperature installations, however, the life of the work-



Aluminum pig casting conveyor, right, has four-compartment cast iron pans.

Freight car loading station has cast-deep-pan conveyor carrying hot sintered manganese nodules up a 25-degree incline.

ing parts is increased far more than might be expected.

Rather than a straight-line function—with the increase in life directly proportional to the decrease in speed—the relationship is geometric. This is comparable to an increase in life in relation to the difference of the squares of the speeds. Reducing the speed, therefore, reflects itself in handsome dividends of increased service life.

Live-bearing pressures of conservative unit value—probably only 75 percent of normal—should be used in designing the wearing parts. Although the temperatures of the working parts are not in the critical range, nevertheless the temperatures are above normal, effective lubrication is lacking, and the ratio of dead load to live load is great.

Terminal equipment also must be suited to the operating conditions. Bronze-bushed bearings — rather than the babbitted or antifriction types—and gravity take-up arrangements are prime necessities. In addition, expansion joints must be provided with enclosures.

Continuous operation at high temperatures is required in many industries. Such conditions necessitate the use of suitable alloys to withstand the full effect of the high temperatures over extended periods of time. The problem involved is one of providing for creep, combating oxidation, and combating loss of strength as it affects working-load capacities. Various manganese, nickel, and chromium alloys can be used for high temperature service.

Drawbacks of Some Units

A review of the principles embodied in the designs of the improved pan conveyor and the leakproof bucket elevator shows why some types of conveyors are not readily amenable to handling hot bulk materials. For example, with steel conveyor belts (either carbon steel or stainless steel) the ratio of the mass of hot material to the mass of the belt is high, thereby intensifying the effect of heat localization. Further, because the belt cannot be loaded to its edges, the temperature of the belt is not uniform across its width. This results in severe expansion within the belt which may cause buckling at the center and subsequent cracking as the belt wraps about the terminal pulleys at each end.

Vibrating conveyors, too, have relatively poor heat transfer. The shape of the trough provides only nominal radiation area; also, there is no return run for further cooling. Consequently, the retention of heat may cause warping and distortion and impede the conveying action.

With the en masse type unit, the chain is completely buried in the material and, therefore, remains at maximum temperature. The surface area is only nominal, and the ratio of the mass of the hot material to the mass of the unit is much too great for efficient cooling. Cooling on the return run also is poor.

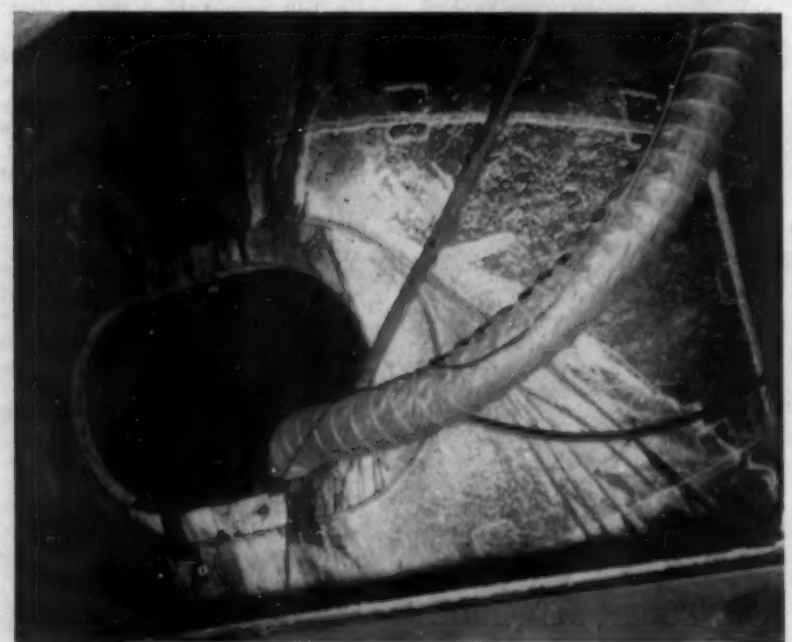
While many installations of belt, vibrating, and en masse units have been used for transfer of hot bulk materials, design and operating factors indicate that improved pan conveyors and leakproof bucket elevators are especially suited to severe conditions or where long life and low maintenance cost are essential to profitable production.

I&P EXCLUSIVE

Photos — Dix Engineering Co., Inc.

Digesters are 15-ft diam, spherical pressure vessels. Steam and blowoff lines enter at the ends of the horizontal axis.

Metallizing Solves Wear Problem



Photos — Dix Engineering Co., Inc.

Dix Engineering Co. metallized the digesters. All work was performed at Otsego.

DON BORDEN, Chief Engineer
Otsego Falls Paper Mills, Inc.

OTSEGO FALLS PAPER MILLS, Inc. of Otsego, Michigan is unique among mills in the Kalamazoo area in that it is a pulp mill as well as a paper mill. Wood is received in 8-ft lengths, chipped, and batch processed in the pulp mill, and the refined cellulose fibers then travel to the paper mill.

In the pulp mill operation, the wood chips are cooked in four spherical digesters. Each of these digesters is a 15-ft diameter pressure vessel of ¾-in. thick carbon steel. Design pressure is 300 psig but normal operations are at 130 psig using direct steam injection through a 4-in. diameter supply line which enters one side of the digester.

After completion of the cooking period, waste black liquors are blown off through a 4-in. diameter discharge line in the opposite side

Photos — Dix Engineering Co., Inc.

Interior surfaces were grit-blasted, metal-sprayed with bond coating, and then metallized with type 304 stainless steel.

of the digester and collected in storage tanks. The waste liquors are disposed of to various Highway Departments for maintenance of secondary roads.

Recently, extensive study was focused on methods to minimize the rate of wear of the digesters. The interior surfaces are subject to corrosion and erosion, and the repeated heating and cooling cycles also have some effect in the form of surface distortion. Investigation of the rate of wear of the digesters, which are constructed of carbon steel, indicated the units had a life expectancy of 10 years. Since each digester costs approximately $22,000, amortization on a 10-year basis constitutes an appreciable annual expense.

Principally, the digester wear problem is one of internal wasting of the pressure vessel, a problem of erosion, common throughout all types of industry. Thus, the greatest attention was concentrated on methods of protecting the internal surfaces. Metallizing appeared to offer the greatest possibilities, and consequently the Dix Engineering Co., Inc. of Lincoln Park, Michigan, was engaged to coat the interior surfaces of two of the digesters. The two remaining digesters also will be coated as soon as they can be taken out of service.

Metallizing Procedure

The first step of the operation was to grit-blast all of the interior surfaces and thoroughly clean the digesters. Then a metallized bond coating, 0.002-in. thick, was applied. The final step was to metallize with type 304 stainless steel to a thickness of 0.010 to 0.012 inches. All of the work was performed on the job at Otsego by Dix personnel.

While the cost of the initial application of stainless steel was relatively high, it is expected that yearly metallizing of thin spots in the coating will be sufficient in the future. No effort was made to even out surface distortions during the initial application, and the engineers feel this may have resulted in a variation in the thickness of the coating at these particular areas. When treating spots during the next application, the technique will be improved by chipping or grinding away high spots to afford a more uniform surface for the metallizing. This procedure is expected to further increase the life of the coating.

Preliminary estimates indicate the metallizing technique will cut the annual expense to less than 1/3 of the cost of replacing digesters on a 10 year cycle. The type 304 stainless steel, metal sprayed coating exhibits excellent wear resistance and the engineers feel they have found a solution to a difficult problem.

Photos — Dix Engineering Co., Inc.

Typical section of digester surface after metallizing.

Photos — Dix Engineering Co., Inc.

Typical section of digester surface before metallizing.

Parallel screw conveyors help make possible a continuous operation in the production, storage, and loading of salt.

Tile Storage Silos Assist Bulk Handling

R. E. BERRY, Manager
Hutchinson, Kansas Plant
Morton Salt Co.

EXCLUSIVE

FOUR DRY SALT silos capable of storing 1500 tons were designed and constructed as part of the storage, bulk loading, and handling

The electrical control panel in the background uses combination starters and interlocks to protect handling equipment.

system for the Morton Salt Co. in Hutchinson, Kansas.

The primary advantage of the storage silos is that they make possible one continuous operation between the filter, dryer, and cooler that receive salt from a set of triple-effect evaporators. The silos also allow for ample dry salt storage to permit the bulk loading of railroad cars; at the same time providing salt to the Mill Department for screening, mixing, and packaging.

Handling Salt

Dry production salt from the coolers is conveyed to the silo building and to any one of three bucket elevators. These elevators discharge to a series of downspouts to processing equipment in the adjoining building. An overflow system delivers the excess salt out across the tops of the silos and into any one of the four silos.

Dry salt flows freely from the silo discharge gate into screw conveyors, which carry it to the elevators to meet the processing equipment demand.

When Demand Exceeds

When the processing equipment demand exceeds the capacity of the production salt from the evaporators, a supplementary quantity of salt is drawn from the bottom of the silos and is conveyed to the elevators. Normally, the flow of salt from the silos to the elevators is set to provide a slight overflow at the elevator discharge — this overflow returning to the silos. When the evaporators are shut down for boil-outs, the flow of salt from the silos is increased to meet fully the current processing equipment demand.

By adequate sizing of the conveyors, railroad bulk cars may be loaded in less than an hour's time directly from the silos—simultaneously with and independently from the operation of all processing equipment.

Railroad cars are bulk loaded on a track scale. The controls for the conveyors bringing salt from the silos are located at the scale beam of these track scales, thus providing fast and accurate control of salt flow to the bulk loading station.

The silos are of vitrified glazed tile construction; designed, manufactured, and erected by the Kalamazoo Tank and Silo Company. They offer the advantages of simple construction, minimum maintenance, excellent weatherproof protection, good insulation, and a neat appearance for many years.

A railroad car is being loaded on the track scales at the bulk loading station. Trucks can be handled equally well.

B. F. Goodrich Co.

This recently developed fire-resistant roof material is being laid over the steel decking of Ford Motor Co.'s new engine plant at Brookpark, Ohio.

Fire Tests Prove Value of New Roof Constructions

POST-MORTEMS on the recent automotive plant fires indicated that the roof construction of the plants produced conditions which accelerated the growth and added to the seriousness of these fires. At actual fire tests staged at public demonstrations, observers saw standard roof panels, fed by combustible gases and dripping bitumen from the roof, turn into infernos. Intense heat, quantities of dense smoke, and secondary fires produced by this standard roof would have made control or containment of such a fire impossible.

To reduce hazardous factors inherent in many of the conventional roof constructions, two new roofing materials have recently been introduced on the market. A vapor barrier of *Koroseal* flexible material manufactured by the B. F. Goodrich Co. prevents drippage of inflammable asphalt or tar by eliminating all combustible materials between roof deck and insulation. The Philip Carey Mfg. Co. has a *Fire-Chex* asbestos-plastic vapor barrier made of materials that do not melt or flow under heat, but instead form a skeletal mat that remains in place and so checks the melting and flowing of asphalt through joints in the steel roof deck when exposed to intense fire from underneath.

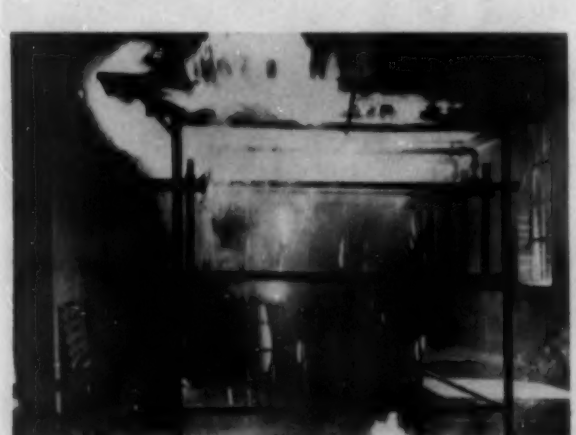
Koroseal Vapor Barrier

The Goodrich *Koroseal* vapor barrier will soon be used to cover 500,000 sq ft of roof at Ford's Brookpark plant. This installation will consist of standard steel decking on which *Koroseal* will be laid. A conventional roof insulation is fastened to the steel deck by insulation clips made of steel. The *Koroseal* itself is a black opaque film, .004-in. thick, and comes in convenient size rolls.

Fire-Chex Product

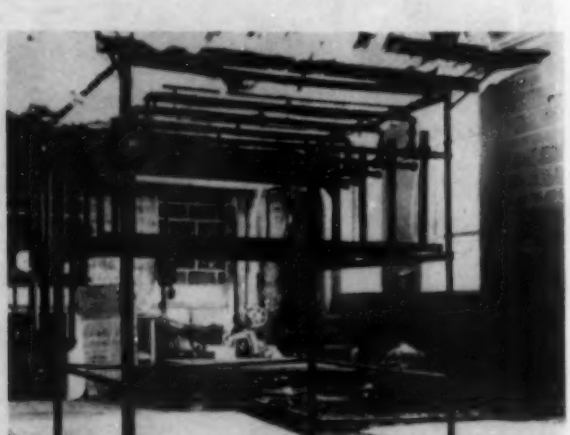
The Philip Carey Co. *Fire-Chex* product can be specified for use with any type of built-up roof over steel, including 10, 15 and 20 year bonded roofs. The Company is expected to approve its application over decks other than steel in the near future.

Both products have been thoroughly tested in the laboratory as well as in actual field tests. In comparison with standard roof construction, the *Koroseal* and the *Fire-Chex* survived the fire tests relatively intact and without producing secondary fires or undue smoke.



Philip Carey Mfg. Co.

Fire test of a conventional-type roof over steel deck shows how dripping of burning asphalt can spread fire.



Philip Carey Mfg. Co.

Complete absence of dripping material and only slight burning of gases characterizes new roofing material.

HOW NEW SOLNUS OILS HELP MAKE AIR COMPRESSORS FIRE SAFE

Actual photographs show amounts of carbon residue left after dropping equal quantities of Solnus and two other oils on steel plates and baking in a closed oven at 500°F for 24 hours. The three oils all had viscosities of 300 SUS at 100°F.

SEE HOW CLEAN SOLNUS LEAVES HOT METAL

New SOLNUS Oil 0.9%

Typical Naphthenic Oil 5.5%

Typical Paraffinic Oil 9.0%

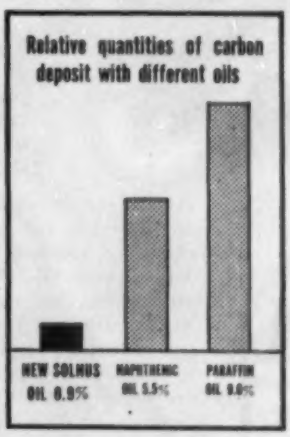
The biggest cause of air compressor fires or explosions is carbon formation on valves and in discharge lines. The best way to avoid these risks is to use the lubricating oil having the lowest tendency to form carbon.

New Solnus Oils have been proved ideal for air compressor use. The minute amounts of carbon that will form are of a fluffy nature; so they blow off quickly and do not build up. Thus the danger of fire or explosion is largely removed.

Solnus Oils have other important advantages, too. Your compressors need cleaning less frequently. This reduces maintenance costs. Shutdowns are less likely. Plant efficiency is increased.

Solnus Oils are also ideal for circulating systems, hydraulic systems, gear boxes, and general lubrication of your industrial equipment. They simplify your storage problems by doing with *one oil* many jobs that would otherwise require *several*. Combine their ability to protect metal parts against corrosion, their resistance to oxidation, and their moderate price and you see how Solnus Oils give you "more lubrication per dollar."

Let us send you our complete technical bulletin on Solnus Oils. Just write Dept. IP-9.



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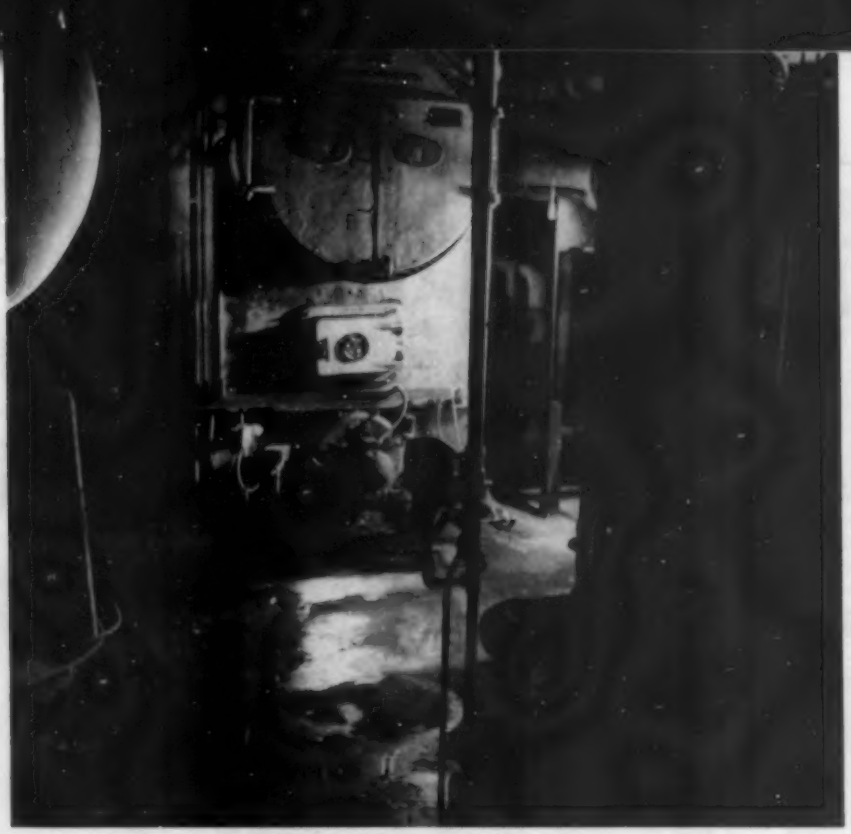


After several attempts to stop the infiltration of ground water, seepage continued to be so serious that a steady stream of water ran across the boiler room floor.

New Chemical Grouting Method Prevents Flooded Floors

I&P EXCLUSIVE

JOHN P. GNAEDINGER
Soil Testing Services, Inc.

IN LOCALITIES where the water table is close to the surface, plant engineers often are plagued with the problem of stopping water from seeping into sub-grade boiler rooms and basements. Methods devised to relieve the hydrostatic pressure by draining off the water or to prevent leakage by making the walls and floors completely watertight are often expensive, and are not always successful.

If the surrounding soil is of a noncohesive nature, a chemical which polymerizes in the voids of the soil to form a solid, impermeable mass offers a promising means of correcting leakage problems. One such method, the Chemject system, has been successfully used to stop an extremely persistent leakage problem in a basement boiler room located close to Chicago's lake shore.

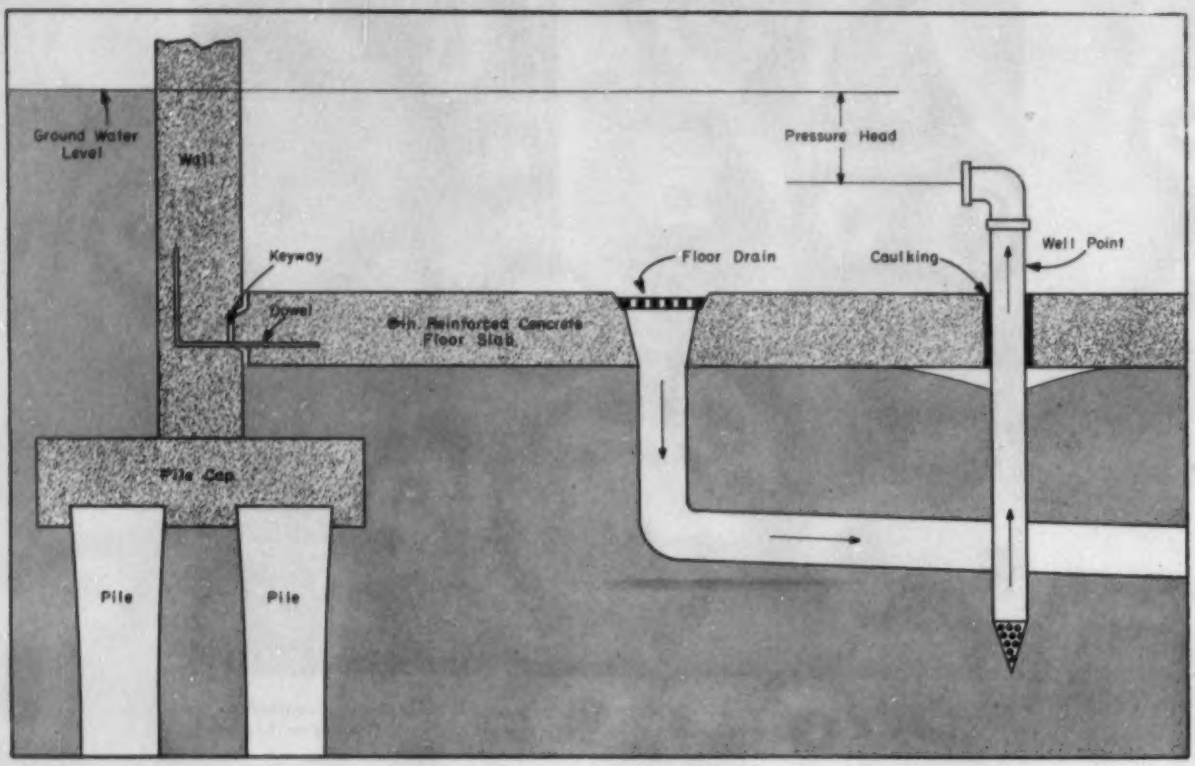
The portions of Chicago bordering Lake Michigan are generally underlain by 15 to 25 feet of sand, deposited on the beaches during the glacial era by the then-existent Lake Chicago. This sand is generally encountered in a dense state, with considerable gravel being present at some locations. In one respect, the sand stratum is fortunate since it provides a natural mat foundation for structures and reduces differential settlements resulting from consolidation of the soft underlying deposits of Chicago blue clay.

Ground Water Conditions

The presence of the sand stratum poses problems, however, since it forms an excellent media for the lake water to flow through. The lake level and consequently the ground water level in the sand immediately adjacent to the lake is approximately 10 feet below the ground surface. Special provisions are usually made in the design of boiler rooms and other basement structures carried below this depth to avoid structural damage due to uplift, and to stop infiltration of ground water through the walls and floors.

In this boiler room the floor is located approximately 6 feet below the ground water level in the adjacent soil. The walls of the boiler room and the inside columns are supported on piles. The floor is an 8-in. reinforced concrete slab keyed into the walls with dowel bars, and water stops, in the form of baffles, are provided in the joints.

Soon after the boilers were put into operation, water began to flow out of the clean-out door openings which are approximately 6 inches above the floor level. Expansion and contraction in the boilers apparently had caused cracking in the concrete resulting in an upward infiltration of ground water through the cracks and into the fire boxes. When a boiler was in operation, the heat in



In the well point method, water discharging from the well points flows over the boiler room floor to floor drains.

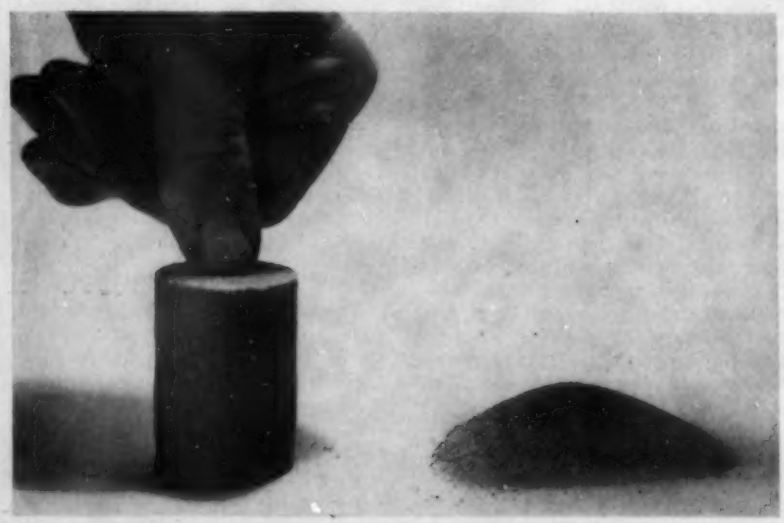
the fire box evaporated the moisture and the flow of water from the door ceased. As soon as the burner shut off, however, the water again filled the fire box and overflowed onto the boiler room floor.

Well Point Method

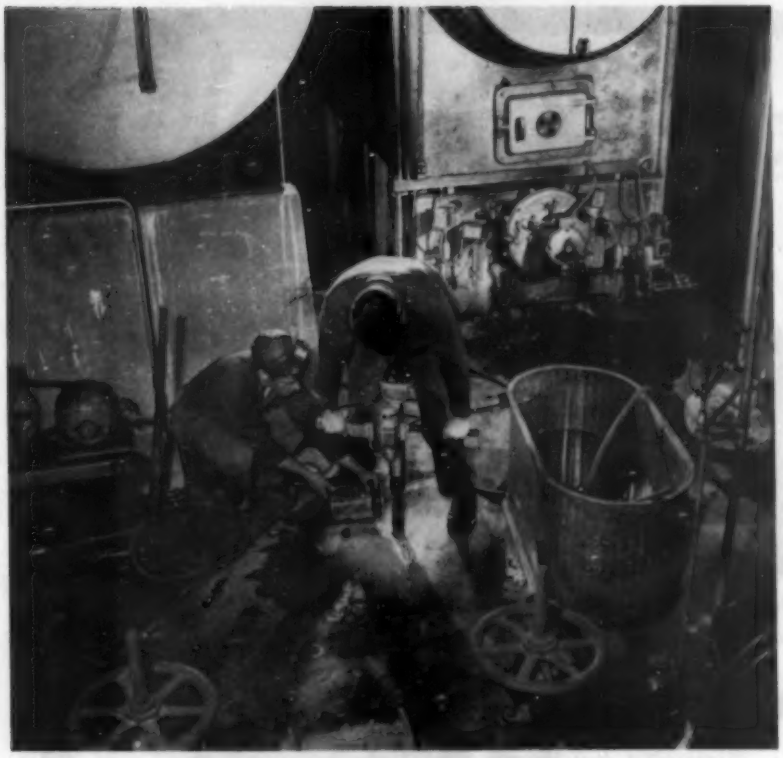
The first remedy attempted was to insert four well points, one between the boilers and three spaced around them. These well points were driven approximately 3 feet into the sand, and caulking was used to prevent leakage where the pipe passes through the floor. The water discharging from the well points then flowed over the floors to floor drains. This attempt to stop the leakage proved completely unsuccessful. In fact, the well points had no effect whatsoever in stopping or even slowing down the flow of water from the boilers.

The difficulty, in this instance, involves the infinite volume of water available to replace the relatively small amounts drained off by the well points. The supply in this location is Lake Michigan and, because the stratum carrying the water is principally sand and gravel, the flow of water through the ground is almost unrestricted. For the same reason, drain tiles placed along the walls and below the floor also would have been ineffective.

There are, of course, other objections to the well point system. Even where it does prove successful, the system requires periodic servicing to avoid silting of the points and to keep the pipes from corroding. Also, the well points, which project above the floor, are a hazard and an inconvenience to operations, and they present the appearance of a rather makeshift arrangement. Further, in this installation it would have been impossible



Core of sand at left shows the cohesion imparted by chemical grout.



Carefully spaced holes were drilled for the injection of the chemical grout.

for the well points to stop leakage through several cracks in the walls.

Expanding Concrete

When the well points failed to drain off the water, it was decided to attempt to eliminate all openings through which the water could pass.

Expanding concrete, containing iron filings, was placed to a depth of several inches over the entire inside base of the boiler, and an additional application was made around the outside of the boiler at the floor line. The placement of this concrete, which required removing all the fire bricks from inside the boiler, involved considerable expense but was unsuccessful in stopping the leaks. Although the fire brick have not been removed to make a critical study, it is probable that the brittle concrete cracked with the expansion and contraction caused by the heat in the boiler.

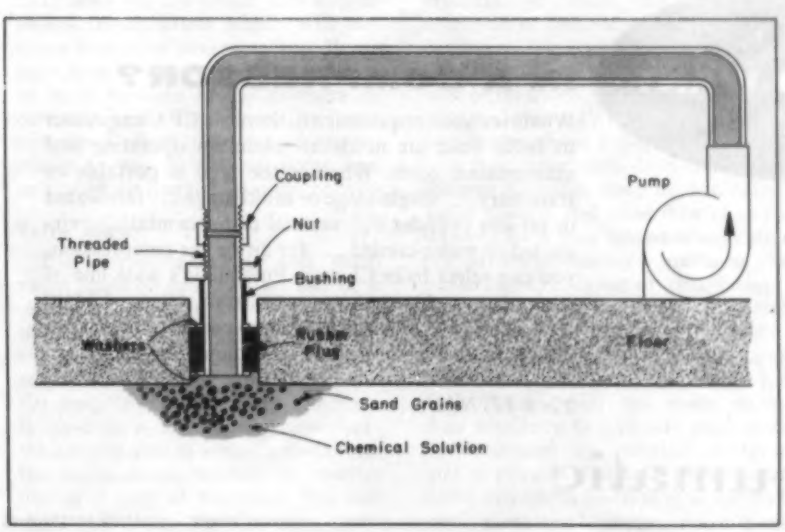
Chemical Injection

With the leakage persisting even after considerable expenditure, it was decided to try the newly developed Chemject system of chemical grouting in order to stop the flow of water by making the surrounding sand impermeable. Holes were drilled at a number of locations, including several at miscellaneous leaks in the walls and at portions of the basement floor, and the chemical grout was pumped into the sand. The chemical used is an aqueous solution of acrylamid, methylene bis acrylamid, with several suitable admixtures and catalysts. After being injected into the sand, it polymerized in place to form a gelatinous mass in the voids between the sand grains.

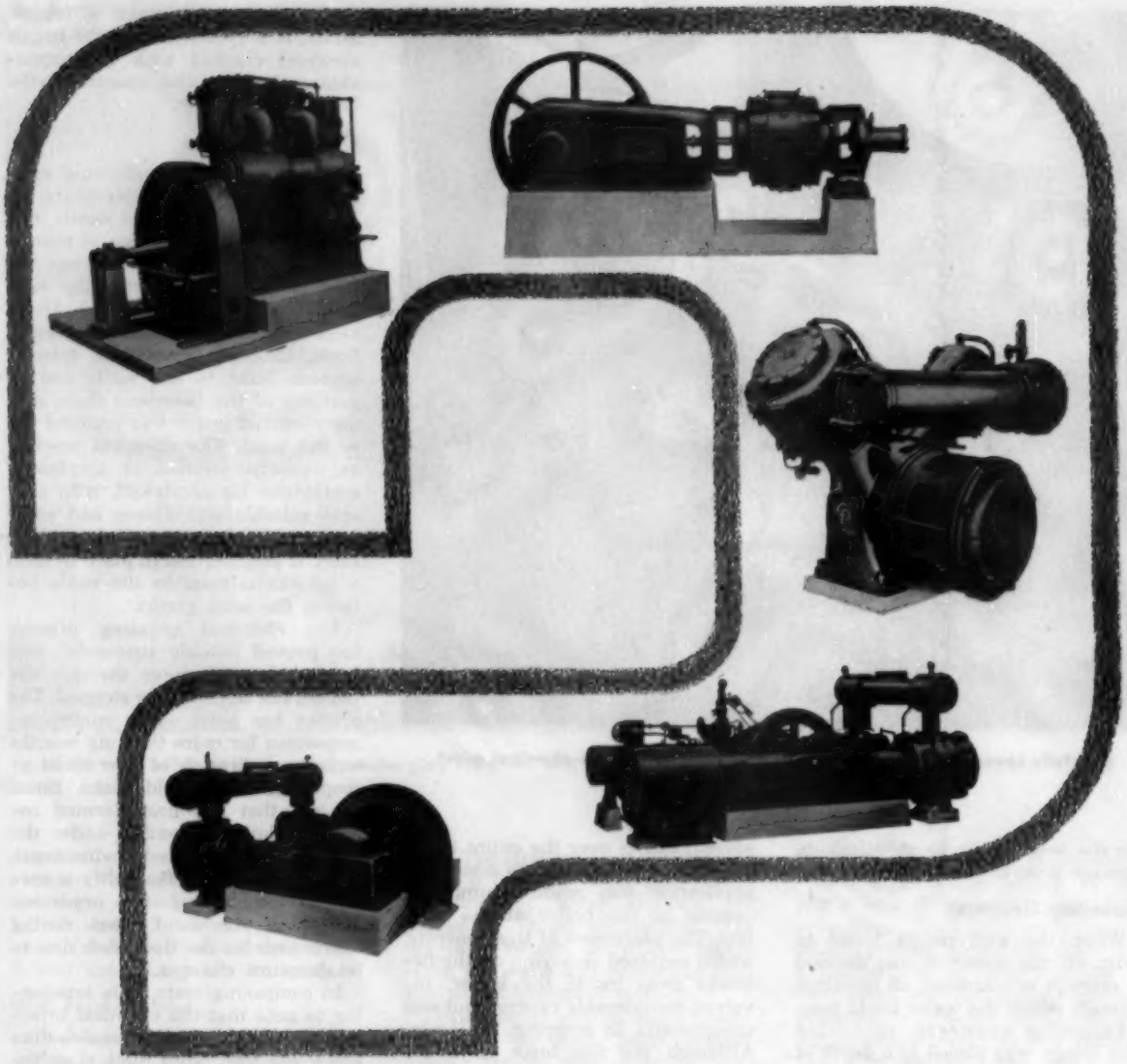
The chemical grouting process has proved notably successful, and further flow of water through the boilers has been totally stopped. The project has been under continuous inspection for more than six months with no indication of new leaks or reopening of the old leaks. Since the gel that has been formed remains relatively flexible under the continuously saturated environment, it appears that this flexibility is useful in maintaining the impermeability of the sand mass during movements in the floor slab due to temperature changes.

In comparing costs, it is interesting to note that the chemical injection process was less expensive than either the well point method or the expanding concrete method previously employed on this project.

In a more recent application, chemical grouting has successfully stopped ground water from leaking into the underground levels of a large downtown building in Chicago. In addition to stopping leakage of water in underground structures, this method of stabilizing sand by the use of chemicals shows promise for such applications as tunneling through sand, construction of caissons in sand, stabilization of loose sands which are subject to the vibration of heavy equipment, stabilization of sands for sewer excavations, grouting of leaks through dam foundations and abutments, and the sealing of irrigation ditches.



Method of pumping chemical into sand through holes drilled in the floor.



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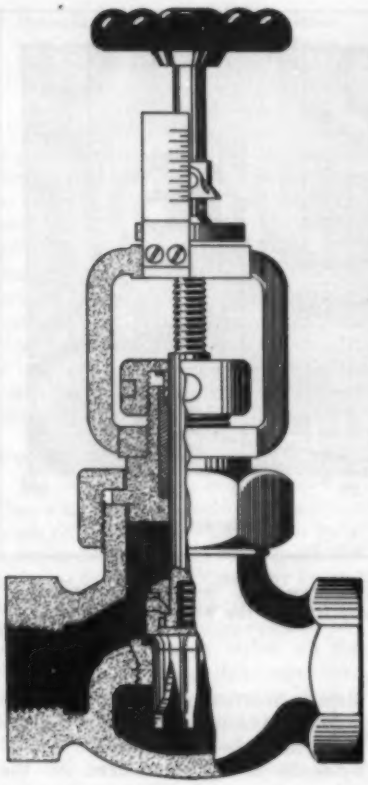


The flow characteristics in a piping system may be varied by using a high lift globe valve. A stem position indicator will duplicate the opening position for precise throttling.

I&P EXCLUSIVE

Getting the Most Out of Globe Valves

Everyone recognizes the globe valve as a common item in piping systems. Too little understood, are the considerations that should govern their choice and usage.

CHESTER S. BEARD, Research and Development Engineer
Foster Engineering Co.
Union, N. J.

THE GLOBE VALVE can be advantageously used wherever it is necessary to control flow by throttling. For full on, or completely shut service, the gate valve or plug cock is more economical.

The word "globe" seems to be an appropriate description of the valve body. The globoidal form evolves quite naturally in the design when a web is placed in the flow. The globe takes form in order to obtain sufficient area for the orifice and also to retain throat areas which will not cause excessive pressure drop. Pressure drop is inevitable in this shape of body because of the changes in direction in the fluid flow. The pressure drop effect is decreased appreciably in the Y shaped body and only slightly less in the angle body.

Valve Seats

The seat or seat ring and main valve must be designed for use as a unit. Selection can be made from a number of different styles, each suited for a specific purpose. Closure may be made with a flat disc on a flat seat. This type is most commonly used as a soft seat valve — although the seat is actually metal and the composition, rubber, or leather disc is a part of the plug. The soft disc will close tightly even with small particles of foreign matter on the seat face. Flat disc valves maintain a straight line flow until the annular opening equals the area of the seat orifice of the valve.

Bevel Disc Design

The bevel disc design is the same as the quick opening valve used for pressure regulators. The flow characteristic of this valve is quite similar to the disc type, having a straight line characteristic through 70 percent of its travel. The surfaces of the plug and seat may be parallel or may diverge by about 3 degrees.

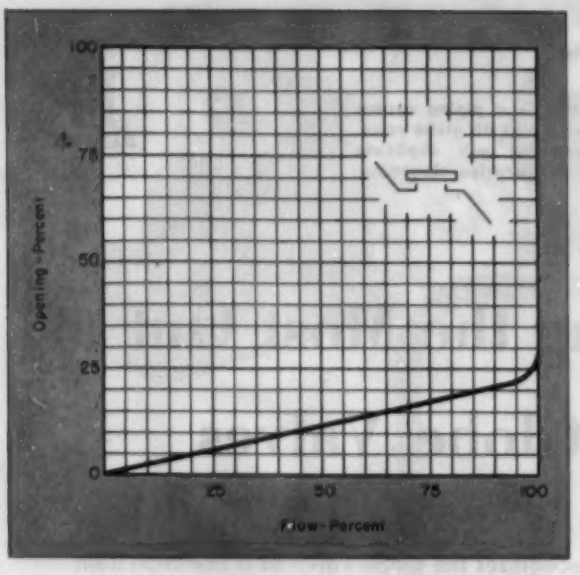
A long taper with deep contact in the seat identifies the plug disc valve. Tight closure and good flow characteristics for a long period of time under severe operating conditions are advantages in favor of this design. The necessity for metal-to-metal contact in both the bevel disc and the plug disc valves requires proper selection of the metal to be used for both the seat and the main valve. Any tendency to gall and seize may be decreased by parallel surfaces and a smooth finish. However, the more successful method is to use dissimilar metals having quite noticeable differences in the hardness of the two parts. When the valve disc is harder than the seat ring, it helps resist formation of a shoulder on the disc due to wear.

Globe valves may be given any desired flow characteristic by the proper use of a ported valve. The lift of this stem, however, must be great enough to utilize this flow characteristic. A stem position indicator will duplicate the opening position for precise throttling.

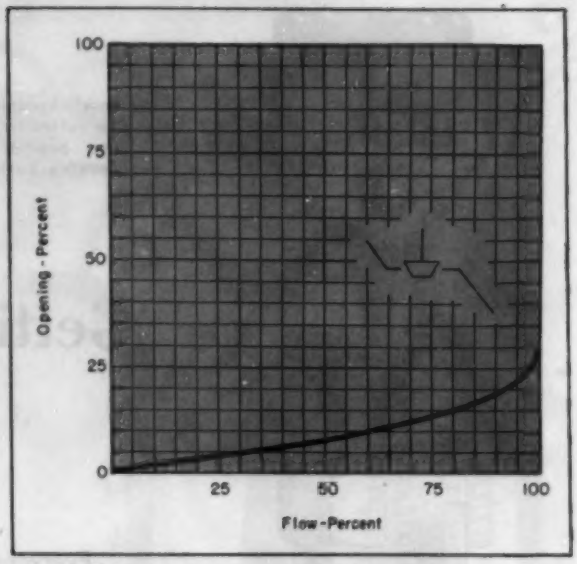
Correct Sizing

Correct sizing of a globe valve is necessary in order to take full advantage of its characteristics for flow control. Some manufacturers can furnish a flow coefficient or a capacity factor for their valves to facilitate sizing. Use of the C_v factor for a quick opening single-seated valve will give fairly close approximations of the capacity of a globe valve of comparable size.

The C_v of a valve is the flow in gpm of water through the valve in wide open position with a pressure drop of one pound. By reference to the formulas in any hydraulics text, the flow of water, gas, or steam, may



Flat disc valves maintain straight line flow until the annular opening equals the area of the seat orifice.



Uniform increase in flow rate through 70 percent travel is a characteristic of the bevelled disc valve.

be approximated for the existing operating conditions.

By-Pass Service

When a globe valve is used in the by-pass around an existing control valve, it should be correctly sized because the globe valve must substitute for the control valve when the latter is out of service. The globe valve is most economical for any control job in which there are large lags in the system; or when the absence of radical or frequent variation in the flow in the system make it unnecessary to use controllers.

Materials

The type of materials specified and their respective ratings will be governed by the frequency of use, pressure drop, and kind of liquid or vapor to be handled by the valve. Globe valve bodies are generally made of the same materials which are used for other types of control valve fittings. Either bronze, steel, or cast iron will satisfy the requirements of all but a few special applications. Bronze bodies up to 3 in. can be used for most services, including steam pressures as high as 350 psig at 550 F. Cast iron bodies can be used for steam pressures up to 250 psig at 450 F. High pressures and temperatures require the use of steel.

Special Applications

The gas and petroleum industries have led the way toward the use of steel bodies for all hydrocarbon gases or vapors and for all steam services except exhaust steam. This tendency toward steel is not based upon pressure or temperature requirements alone. One reason steel is used in process installations is that in the event of a flash fire, it will not rupture as a result of the heat and subsequent quenching by fire hoses. Another factor favoring steel is the necessity for continuity of the steam service during a fire in order that pumps or firebox quenching nozzles can be operated.

Individual Consideration

A consideration of the list of specifications for materials for body and trim for any individual industry—paper mills, for example, shows that all-encompassing arbitrary rules are not possible. Highly corrosive fluids may require special metals. Electrolysis may be minimized by using identical body and trim metal; however, the use of cast iron, which is replaced periodically, may be more practical and economical in the long run.

Stem Construction

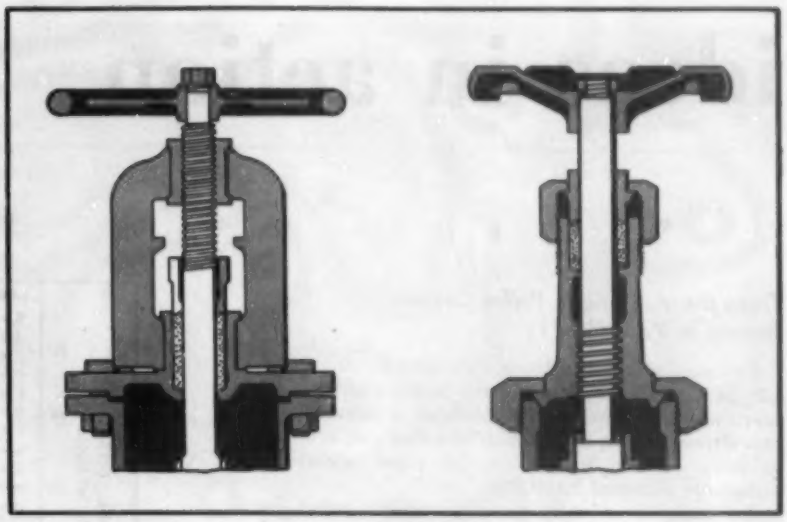
Valves are constructed in the form of rising spindle, rising stem, and stationary stem. The spindle of the rising spindle type lifts as the handwheel is rotated. In the rising stem construction, both the handwheel and the stem are lifted. Stationary stem valves lift the main valve by threading the stem into the main valve. The main valve must be guided against rotation so that it will rise with the stem rotation. The rising stem is practically standard in globe valves. Although sufficient headroom must be provided, the visual evidence of the movement of the main valve is valuable.

The threads on the stem may be outside the body or below the packing. Choice between these two different types must be made upon the basis of the answers to the following questions:—Which is more detrimental to the threads; the fluid flowing through the valve, the atmosphere, or the possibility of salt water spray outside the valve? Will the fluid in the valve lubricate the threads or will it remove or dissolve the lubricant? The necessity for frequent lubrication will indicate the use of external threads.

Packing Glands

Whether the thread is on the stem outside the body or below the packing makes no difference in its effect upon the packing used since both types require that the stem rotates as it rises. Valves are available with screwed gland or bolted gland packing followers. The screwed type predominates on valves 2 in. or smaller and on services up to at least 4000 psi. Bolted type packing glands become structurally necessary as the stem size increases and are recommended for very high pressures. Use of the bolted type gland precludes inadvertently backing off the gland follower because of inability to determine how many threads are still holding it in place.

Bonnets are available in three de-



Threaded stems are used either with the thread outside the body (left) or below the packing (right).

signs: the screwed, union, and flanged union. Objections are raised to the screwed type because the bonnet can be loosened by applying force to open it where there is a stuck or jammed stem, or, when a jammed stem is mistaken for a fully opened valve. The union type bonnet lends itself to use as a guide for grinding in a worn seat and plug. The flanged construction is recommended for large valves.

Tight Seals

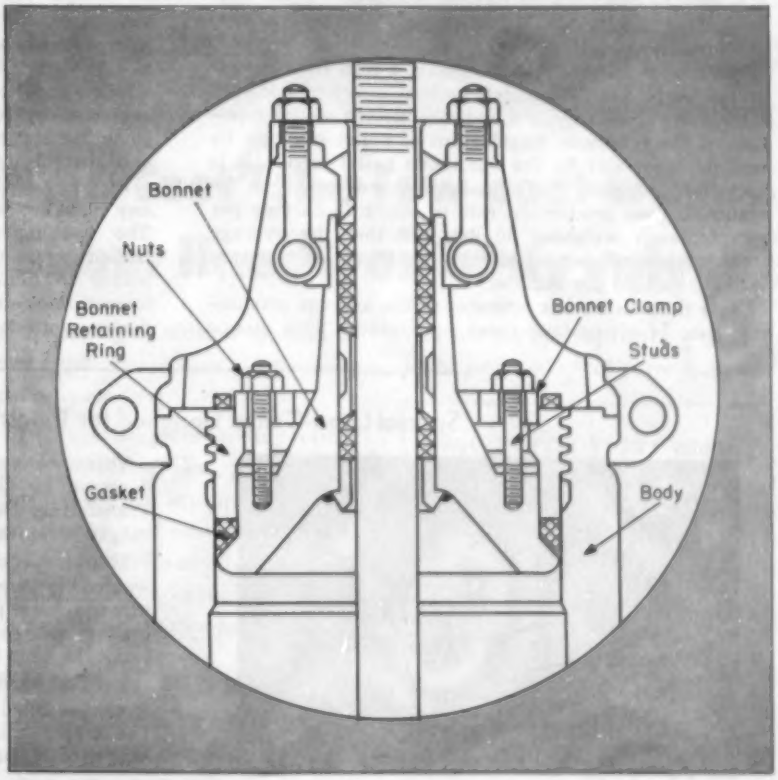
Most globe valves are designed so that a tapered or machined shoulder seats on the bonnet when in the fully opened position, thus sealing off the stem so that the packing may be replaced under pressure. With the discharge side of the valve open to atmosphere, such as a valve on the drain from a tank, this repacking may be done with the valve closed. Special valves for service on valuable or dangerous fluids are available with bellows or diaphragm seals rather than packing.

Pressure-sealed bonnet construction is used for large high-pressure valves. The design employs the line pressure to expand a gasket, thus increasing the tightness of the seal with increasing pressure. This design has cut down the weight of high-pressure valves as much as 60 percent as well as eliminating bolt problems and leakage under conditions of rapidly decreasing temperatures — which often occur when equipment is being washed down.

Direction of Flow

Oddly enough, most references to the direction of flow through globe valves, whether they be straight, angle, or Y, assume that the flow enters under the seat, passes through the seat orifice, and leaves the valve. This is true for many applications. Fortunately, the general design is based upon this direction of flow, for manufacturers know the stem forces in the closed position, the seating strength against closure, and the tendency to seize, are more critical with the valve body in this position. The possibility of full pressure on the packing for extended periods is decreased when the discharge pressure is against the packing of the valve.

Boiler Code requires the pressure to be under the disc on valves in feedwater service in order to assure that water gets to the boiler if the main valve should come loose from the stem. On the other hand, applying pressure above the disc is the correct procedure for services in which a throttling action is desired, as on a drain or effluent from an open tank or pressure vessel. When the valve is installed so that the fluid pressure is above the disc, the overspeed of an engine or loss of valuable fluid can be checked if the disc becomes disengaged. It is important that there be some means of identifying the manner in which the valve is installed so that the operator will not become confused.



Pressure-sealed bonnet design for the large high-pressure valves uses line pressure to expand the gasket.

ideas in action

. . . in U. S. industrial plants

Does the Automatic Pallet Loader Belong in Your Plant?

For most plants the day of complete automation is far off: for some it may never come because of high equipment and instrument costs involved. However, there is one element in the automation idea that can and already is being applied to present-day plant operations — automatic material handling.

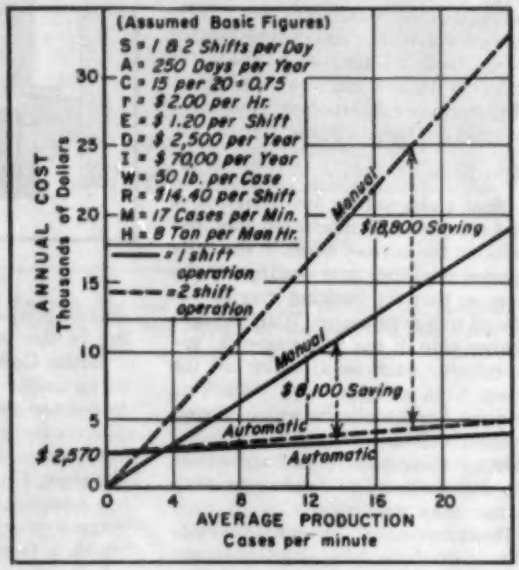
An instance of this is the automatic pallet loader developed by Lamson Corp. which receives cartons from one or more sealing machines and stacks the cartons on

pallets according to a predetermined pattern. As each pallet is loaded, it is automatically ejected from the machine and replaced by an empty pallet.

Advantages are substantial. It practically eliminates manual handling of cartons after they leave the packaging machine; handles up to 30 different size cartons a minute without worker fatigue; forms a compact load, free of overhang; and when used in conjunction with a system of collecting conveyors, will palletize the output of a number of packaging machines scattered throughout the plant.

Several years ago F. N. Landon of Sun Oil Co., one of the early users of pallet loaders, developed a very interesting cost analysis that bears closely on the question of the economic justification of pallet stacking by manual labor and by the automatic pallet loader. It is important to note that his figures are based on an assumed plant production rate of about 15 cartons per minute, each weighing 50 lbs, and that the average stacking rate of manual worker handling these cartons is 5-1/3 cartons per minute.

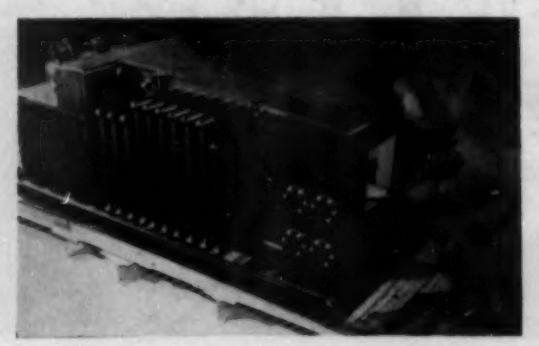
Note that the curves intersect at the average production rate of about four cases per minute. This means



that below this production rate, manual operations are more economical than automatic pallet loading. In practice, however, the generally-accepted production rate at which an automatic pallet loader system is considered economically justified is about 15 cartons per minute, since the cost of the entire system including conveyors and controls must be considered.

In general, the pallet loader can duplicate virtually any stacking pattern that can be produced manually. The stacking pattern formed by the loader is controlled by an electronic cartridge, which causes the loader to follow a set sequence of operations. The formation of alternating patterns on successive layers is done automatically.

Special Load-Center Designed for Tungsten Mines

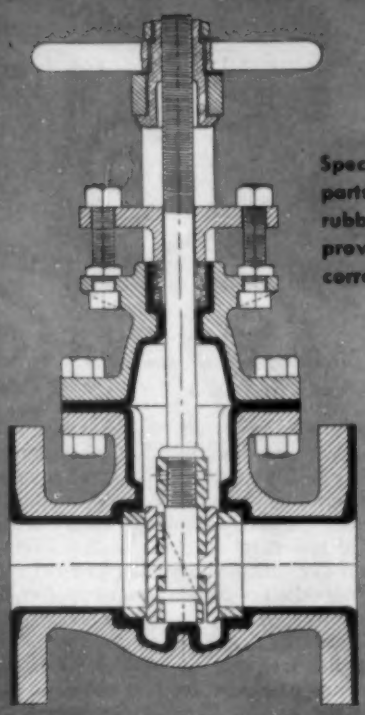


This unconventional 150 kva load-center was specially designed by General Electric Company's Distribution Transformer Dept. for use at the Sominar subterranean tungsten mines for Los Condores Mines, Argentina.

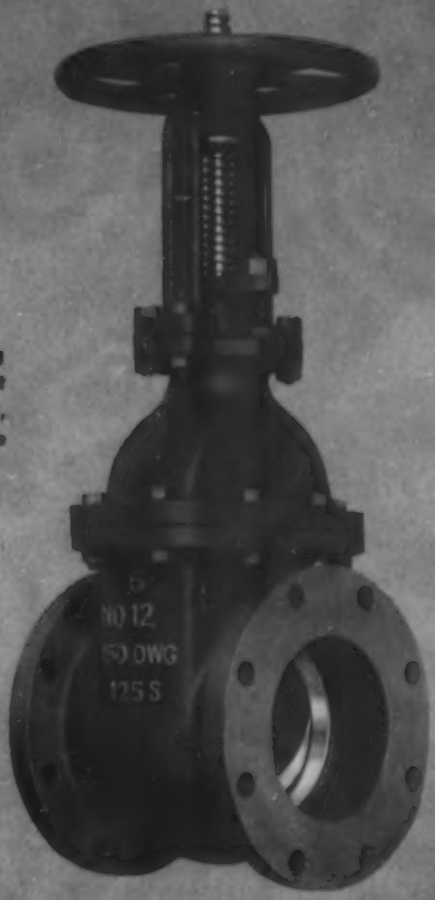
The load-center is equipped with wide surface skids welded to the base structure to facilitate dragging through mine passageways. It also has special internal bracing and extra-heavy lifting lugs that permit lowering the unit by one end down a main mine shaft.

Rated 150-kva, 2400-400Y/231 v, the unit's transformer is filled with non-flammable Pyranol dielectric. The entire unit is only 42 in. tall, less than half the height of a convential 150-kva load center.

DARLING VALVES



Special alloy working parts, and permanent rubber-to-metal bond, provide trouble-free corrosive service.



Meeting the "Acid Test" the low-cost way with DARLING rubber lined iron body valves!

YOU can save dollars by installing Darling rubber lined, iron body gate valves for corrosive services up to 150°F. These Darling gate valves are giving outstanding service in job after job.

You Get This Plus Value Too!

The *fully revolving double disc,* parallel seat principle compensates automatically for valve body distortion. Tight closure is assured every time. And wear on working parts is *uniform.*

In plant after plant Darling rubber lined, revolving disc, parallel seat gate valves are setting records of efficiency and economy. These unique rubber lined valves are made in rising stem, cylinder, motor-operated, or quick-opening types.

Ask for the special Darling rubber lined *gate* and *check* valve bulletin.

VALVES FOR EVERY NEED

Darling also offers gate valves in a wide range of sizes, types and construction for all kinds of normal and unusual service . . . and for pressures up to 1500 pounds.

DARLING VALVE & MANUFACTURING CO.

Williamsport 9, Pa.

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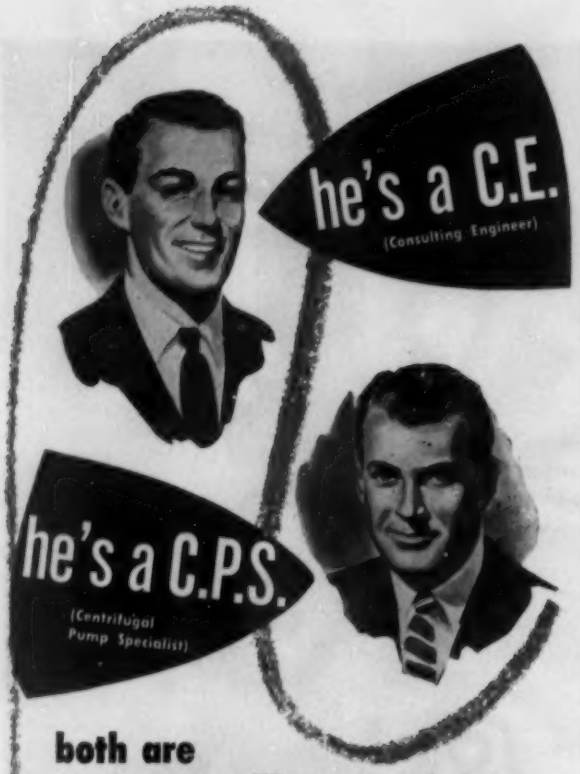

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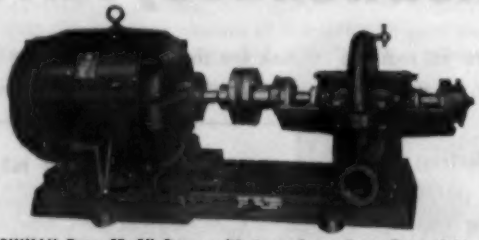
Like the Consulting Engineer, Centrifugal Pump Specialists from Weinman draw from a broad, cumulative background of experience that enables them to efficiently and capably solve your pump problems. They know pump design, installation and applications from A to Z . . . your assurance that when you turn to Weinman, your liquid-handling requirements will be fulfilled, economically and speedily, with a Weinman pump or pumps that will exactly fit your specific needs.



WEINMAN Type SB 2" Pump with tapped openings. Dependable and quiet-operating. Ideal for water circulation in air conditioning or radiant heating installations and many industrial uses. Retains all the desirable features of a split case design yet is available at a moderate price. Write for Bulletin 519-A.

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The WEINMAN Pump Mfg. Co.

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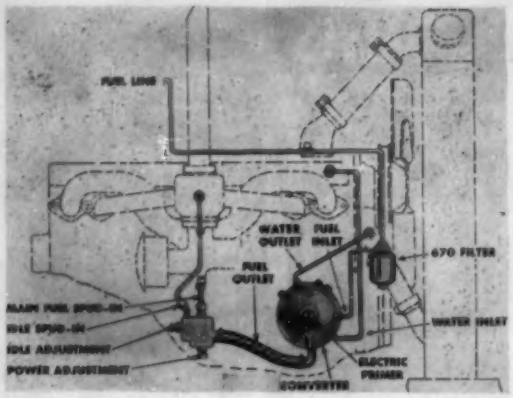

LP Gas Provides Safe, Low Cost Fuel For Fork-Lift Trucks

Emerging into the industrial truck field a little more than two years ago, LP gas is now rapidly becoming an accepted fuel for material handling vehicles in both large and small plants from coast to coast, according to the American Liquid Gas Corp. In addition, some manufacturers of industrial trucks are now offering LP gas carburetion systems as optional equipment.

Fork-lift trucks are generally operated at slow speeds and are allowed to idle for relatively long periods of time thus building up sludge and carbon in the crankcase requiring frequent oil changes. Because LP gas enters the engine in vapor form, it leaves no carbon, lead, or varnish deposits to cause sticky valves and sludge. And because it is a clean, dry burning fuel which vaporizes completely, no liquid enters the cylinders to cause dilution of the crankcase oil. No objectionable odor or obnoxious gases are emitted when LP gas is used, giving it a distinct advantage for in-plant use.

Conversion of gasoline operated engines to the use of LP gas is a relatively simple job which can be performed by any automobile mechanic after receiving simple instructions. Standard LP gas carburetion equipment has been engineered to meet every type of engine specification. Conversion consists of changing the conventional gasoline carburetor to an LP gas carburetor, or if desired, a spud-in kit may be used to spud into the existing gasoline carburetor. A converter and a filter are necessary to complete the system.

Plants now using LP gas for other purposes need merely add a liquid transfer pump, meter, hose, and fueling nozzle to present piping in order to refuel the trucks. Plants that do not maintain bulk storage on their premises are solving their fuel problem by purchase of extra removable tanks which can be quickly changed when empty.

This fuel system, for many years considered a safety hazard, has reached a point where it has the full approval of the Board of Fire Underwriters, providing, of course, that the proper fittings are used and normal precautions in handling the fuel are followed. The LP gas industry has established uniform specifications and the Underwriters' Laboratories have established certain

Garden spot for **power...**

Four type H-10 Sterling B & W Boilers with steam capacity of 7,500 lbs. per hour. P-D Collectors are mounted behind boilers with the P-D Fan Stacks directly above.

General view of plant from garden-like park surroundings. Note 4 P-D short Fan Stacks.

...kept free from flyash with P-D Dust Collectors

A model power plant, set in a garden, was realized by Cerveceria Modelo, S.A., Cotorro, Cuba. This company, a part of the Bacardi interests, determined to maintain a garden-like atmosphere surrounding the plant.

Although boilers are completely automatic, Prat-Daniel design 6HC horizontal Dust Collectors were installed to collect flue gas residue resulting from oil-firing. P-D Fan Stacks insured adequate, constant draft through boiler and collectors. Capacity of these collectors at 580°F. is 4860 CFM at 1.75 in WG resistance.

Your plant can enjoy garden-like surroundings, kept free of dust, with P-D Collectors. Why not contact our project engineer today?

Project Engineers

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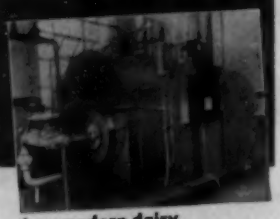
Dutton EconoTHERM EARNS OWNER PRAISE

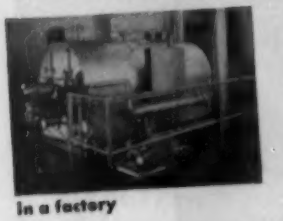
In a railroad roundhouse



In a modern dairy

In a food processing plant

In a hospital



In a factory

In an institution

In a concrete plant

In a municipal waterworks

AND HERE'S WHY!

Verbally and by mail* owners have enthusiastically reported big savings in fuel, labor and space — often all three — thanks to EconoTHERM's efficient Off-center Firing, Rotary Combustion and Automatic Operation.

EconoTHERM gives quick steam with greater safety . . . saves fuel, labor and maintenance expense. Gas or oil fired, sizes are available to 250 H.P.

Get all the facts on the Dutton EconoTHERM's compact, modern packaged design and automatic operating features. See how it can satisfy your steam needs and save *you* money!

*Ask to see the letters!

Write for EconoTherm Bulletin EC-52C

CHECK FIRST with Dutton

Dutton BOILERS

DIVISION HAPMAN DUTTON COMPANY
KALAMAZOO MICHIGAN BOILER BUILDERS SINCE 1880
FOUR TYPES SIZES FROM 5 TO 250 H.P.

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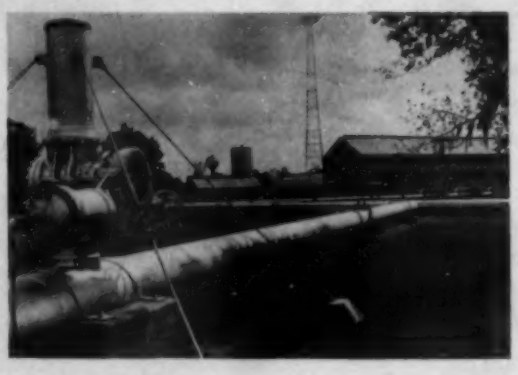
ideas in action

—Starts on page 86

requirements which have reduced hazards in connection with LP gas.

A typical example of the large industrial plant changing to the use of LP gas on industrial truck equipment is Lockheed Aircraft Corp. which is now converting its entire fleet of approximately 130 units of material handling equipment in use at the Burbank, California plant to LP gas.



Jet Action Of Blow-Down Valve Can Damage Your Piping System

Unless foundations are properly designed, the "jet" action of gas line blow-down valves can seriously damage a piping system, according to field reports by engineers of Rockwell Manufacturing Company's Meter and Valve Div.

Action of the blow-down system may be compared to a jet plane's engine. When the valve is opened, the gas issues into the atmosphere at the velocity of sound. The high-velocity jet action of the discharging gas results in a reaction in the blow-down system, causing it to move in a direction opposite to that of the gas.

In a recently investigated case, the jet effect amounted to the equivalent of 16,000 hp — far greater than the power of any jet plane in existence.

The jet effect is most severe at the beginning of the blow-down period: as the line pressure decreases to zero, so does the jet effect. In designing the foundation, account should be taken of the maximum force exerted by the jet effect rather than taking an average figure for the force during the entire blow-down period. The well-designed foundation in the illustration includes a pre-cast concrete base and steel bracing.

G.E. To Swap New Transformer For Oldest

"Who's got the ding-dong, who's got the bell" isn't nearly as interesting as who has the oldest medium-size transformer still in service according to an announcement by General Electric's Power Transformer Dept.

G-E is offering to exchange without charge a similarly-rated new transformer for the old unit. The value

Planning A Fly Ash Recovery Installation?

Consider these important advantages of a WESTERN PRECIPITATION CMP UNIT!

(Top) View of CMP unit at Utah Power & Light installation. Note compactness of unit. (Above) Close-up of same installation.

IF YOU are planning the installation of any type of fly ash recovery equipment—mechanical or electrical—it will pay you to investigate the extra advantages to be gained by installing a CMP Unit designed, engineered and constructed under *one* responsibility by Western Precipitation Corporation—*leaders in both electrical and mechanical recovery fields!*

Combines Mechanical and Electrical Advantages:

A CMP (Combination Multiclone-Cottrell Precipitator) Unit combines—in one compact installation—both mechanical and electrical recovery principles, so that maximum benefit is obtained from the advantages inherent in each method. The MULTICLONE section centrifugally cleans the gases of the larger and heavier fly ash particles (down to a few microns in diameter) . . . and the COTTRELL Precipitator then electrically removes the very small particles remaining in the gases. This combination arrangement has important advantages:

1. Using the MULTICLONE for cleaning out the heavier particles permits the bulk of the recovery operation to be performed with relatively low-cost equipment.

2. Using the COTTRELL for final clean-up insures unusually high recovery efficiency—approaching theoretically perfect, if desired—with a high efficiency, compact Precipitator unit.

3. Each type of unit—MULTICLONE and COTTRELL—can be arranged for its most efficient application. MULTICLONES may be connected to each separate boiler, if desired, and their draft requirement cut out when the boiler is down . . . while a central COTTRELL handles all gases and operates at higher efficiencies, with continued low power cost, when one or more boilers are down.

4. During soot-blowing periods, or while warming up cold boilers, the MULTICLONE efficiency usually increases, preventing overloads of detrimental carbon from reaching the COTTRELL.

Only Western Precipitation Combines Multiclone and Cottrell "Know-How"—in ONE Organization!

A vital factor in obtaining maximum efficiency and economy in CMP installations is the proper balance of mechanical and electrical recovery equipment to the individual requirements of *each* application. Western Precipitation is unique in that it not only pioneered the commercial application of COTTRELL Electrical Precipitators over 43 years ago, but also has been a leader for many years in the *mechanical* recovery field with its widely-recognized MULTICLONE Collectors.

Result—Western Precipitation has the all-important "know-how" and experience in BOTH fields . . . knows from first-hand experience how to fit the *right* equipment in the *right* place, to do *your particular* job . . . and can provide the complete installation under ONE responsibility and ONE overall guarantee!

Let Our Experienced Engineers study your recovery requirements and make recommendations on the equipment best suited to your operations. A wire, phone call or letter to our nearest office places this unique "Know-How" at your service, without obligation!

Send for descriptive literature!

WESTERN Precipitation CORPORATION

DESIGNERS AND MANUFACTURERS OF EQUIPMENT FOR COLLECTION OF SUSPENDED MATERIALS FROM GASES & LIQUIDS

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Cooking Vats,
Retorts,
Ovens,
Dry Kilns,
Pasteurizers,
Etc.**

What is YOUR temperature regulation problem? How close must the temperature be held? At what temperature? What pressure?

Whatever your problem, ATLAS engineers have very likely encountered similar ones, possibly more difficult than yours. ATLAS has been in the regulating valve business *exclusively* — nothing else — for more than a half century.

For instance, if you are a regular reader of INDUSTRY & POWER you have doubtless observed that a wide variety of ATLAS Regulating Valves have been shown in these pages for many years.

The Temperature Regulator shown here is spring loaded. Vapor pressure operated. Completely self-contained. For steam pressures to 300 lb. per sq. in. Controls temperatures from 60 to 300 deg. F. Single seat, needle type. Stainless steel internal trim. Shuts off dead tight and holds set temperature accurately. Furnished complete with thermal unit and capillary tubing. And, if desired, it is furnished reverse-acting for cooling processes.

It may be that this is the temperature regulator you need. Maybe not. ATLAS engineers will gladly study your problem with you to furnish the best regulation obtainable.

We Guarantee

that all ATLAS Temperature Regulators are tested with steam under the temperature ranges for which they are suited. If any defects are found or the regulator does not operate satisfactorily within the ranges specified, the Regulator may be returned for immediate replacement or credit.

If you have other regulating problems, you can put them with confidence in the hands of ATLAS engineers.

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REGULATING VALVES FOR EVERY SERVICE

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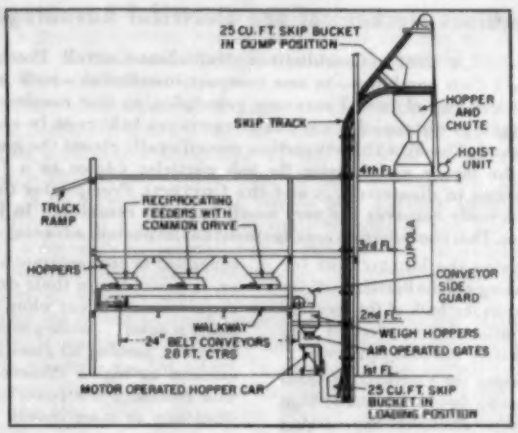
of the replacement could be as little as $4000 or as much as $40,000 the department figures. The old transformer will be set up outside the company's new Medium Transformer Plant at Rome, Ga. as a monument to the great strides made by the Nation's electric utilities and electric equipment manufacturers in advancing the art of distributing electric energy, and to the part that standardization has played in this progress.

Specifically, the department is looking for any General Electric (or Stanley Electric) transformer in the range of ratings covered by the ASA Standards—501 to 5000-kva, single-phase; 501 to 10,000-kva three-phase; 69,000 v and below, 60 cycles. The transformer must have been in continual service (except for normal periods of maintenance, spare duty, or relocation) as of May 11, 1954 — date the new Rome plant was officially opened. The oldest transformer could be close to 60 years old since transformers larger than 500-kva were built as early as 1896, according to the company's records. William Stanley, inventor of the transformer, placed the first practical a-c system in operation in 1886.

The oldest entry will be determined by a panel of judges including D. B. Lawton, Manager—Rome plant; L. Wetherill, Manager—Engineering, and J. W. Butler, Manager—Marketing, Power Transformer Dept.

Search for the oldest transformer will end Nov. 1. Any company having an old unit that might qualify may enter it through General Electric's numerous apparatus sales offices throughout the country.



Conveyor System Cuts Cupola Charging Costs

Loading cupolas with slag and coke at the American Rock Wool Corporation's New Jersey plant was a heavy, dirty job requiring three men per shift. The new mechanical handling system recently installed enables one man to handle 250 tons per shift and assures accurate charges to the cupolas.

Reciprocating feeders deliver material to belts that, in turn, deliver to weigh hoppers. Automatic controls stop the belt when a pre-set weight has been delivered.

(Continued on page 110)

BREECHINGS · STACKS

AIR AND GAS DUCTS

PLATE FABRICATION FOR POWER PLANTS

KIRK AND BLUM
FABRICATION

Whatever your requirements in fabricated plate, sheet or structurals for power plant use . . . call on experts!

Kirk & Blum has fabricated a variety of power plant needs as big as the mammoth breeching section shown here. In a 150,000 sq. ft. plant, with crane capacity to 25 tons, Kirk & Blum has complete facilities to produce, pre-assemble and load the largest fabrication. Kirk & Blum has the men, materials and experience to do the job quickly and economically.

For detailed literature, write: The Kirk & Blum Mfg. Co.
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bulletins

. . . for listing of the bulletins just received see page 34

AIR CLEANING & DUST COLLECTION

250—Small Scale Dehydration

To meet the increased demand in engineering operations for small volumes of dry gases not warranting plant size installation, this company has developed the Hydryer, described in seven-page booklet. J. F. Pritchard & Co., Equipment Div.

251—Dust Collectors and Arrestors

Series of four folders describes cyclone type collector and portable, standard, and automatic bag-type dust arrestors. Also includes 32-page catalog describing exhaust fans for dust collecting and air handling. Northern Blower Co.

252—Dust Collectors

Dust collectors, including cyclone, wet or dry dynamic, and cloth screen arrestor types are the subject of a 32-page bulletin. Uses of air conditioning, ventilating, conveying, drying, and cooling units are presented. Kirk & Blum Mfg. Co.

253—Precipitation Equipment

Engineers contemplating the installation of equipment for recovering dusts, fly ash, fumes, mists, fogs, or other similar suspensions in stack or process gases will find much valuable data in this 40 page booklet. Western Precipitation Corp.

254—Electrical Precipitators

Booklet 2-ATC covers the history and fundamentals of electrical precipitators, design and construction, dimensions and capacities, electronic power supply, selenium power supply, and installation stories. Provides an up-to-date discussion with illustrations of latest developments. The Aerotec Corp.

255—Tubular Dust Collectors

Booklet, 2-PDC and 3-PDC on mechanical dust collectors cover capacities and efficiencies, dimensions, construction and the decantation method. Latter method is used on installations where re-injection of large, unburned high carbon particles is required for economical operation. Prat-Daniel Corp.

256—Industrial Dusts

Booklet 3-TTC gives a brief background of modern dust problems and an approach to their solution. Discussed are sources of dust, determining dust size, prediction, fly-ash emission codes, types of dust and methods of control. Diagram shows distance of dust travel from source. The Thermix Corp.

257—Dust and Fume Removal

This 19-page bulletin, 610, pictures and describes the standard units that go to make up the Multi-Wash System for the removal of air-borne dust, fumes, vapors, and odors. Besides explaining the operation and advantages of each component of the system, the booklet includes many photographs. Claude B. Schneible Co.

AIR CONDITIONING — HEATING & REFRIGERATION

258—Temperature, Moisture Control

Precision control of air temperature and moisture enable you to produce your product in any climate, at any season, according to six-page bulletin 122. The Type "A" air conditioner described, for drying or moistening of air, is shown in typical installation photographs. Niagara Blower Co.

259—Propeller Fans

Three new models are among the 13 types of fans shown in 40-page bulletin A-109. It also describes three types of roof ventilators, unit heaters and intake air units, and includes specifications, dimensions, and performance figures on all of the equipment plus valuable engineering data. Hartzell Propeller Fan Co.

261—Unit Heaters

Catalog CUH 846-A gives the complete story on Grid unit heaters. Catalog BC-1040 describes Grid blast coils for process drying. How the construction of the unit heaters prevents electrolytic corrosion is explained in booklet "Corrosion in Unit Heaters." Three useful reference books. D. J. Murray Manufacturing Co.

BOILERS & STEAM

262—Vertical Unit Boiler

More than 25 years of development, manufacturing, and application experience are reflected in the design of the Type VU-10 vertical-unit boiler described in 16-page bulletin VU 10-8. Advantages and design features are discussed. Various possible installations are shown. Combustion Engineering, Inc.

263—Refuse and Wood Burning

Engineering data concerning spreader stokers installed to burn refuse or wood are contained in 24-page booklet 505. Stationary, manual dumping, power dumping, and traveling grate installations having maximum capacities from 10,000 to 275,000 lb steam per hr, steam or compressed air operated, are described. Detroit Stoker Co.

264—Boiler Controls

Specifications for the fully automatic, all electric metering type packaged control for shop assembled boilers are given in four-page folder 53-1088-239. Schematic drawing shows a typical packaged control system for a combination oil or gas fired boiler. The Hays Corp.

265—Simplified Boilers

The new line of simplified Powermaster packaged automatic boilers in sizes 15 through 100 hp, light oil or gas, are discussed in eight-page bulletin 1230. Details of design and construction, a cutaway view, and sample specifications are given. Orr & Sembower, Inc.

266—Pressure Equipment

One of the country's oldest manufacturers of equipment and accessories for plants piping steam, air, and gas under pressure, has published catalog 400, covering its line of separators, traps, and boiler trim. A condensation of the information in catalogs 500, 600, and 700, the booklet gives size and pressure tables and technical data. Wright-Austin Co.

267—Boiler Replacement

"What Every Business Man Should Know About Boilers," has been prepared to give executives a better understanding of boilers and a realization of the tremendous loss that industry is taking due to obsolete and inefficient steam generating equipment. Chances are two to one that your boiler is obsolete, according to this 14-page booklet. Superior Combustion Industries, Inc.

268—General Catalog

A wealth of research, engineering, and manufacturing experience, gained since the founding of this company in 1880, is incorporated in the products described in four-page folder. Steam generators, heat transfer equipment, pressure vessels, valves, and fittings are shown. Henry Vogt Machine Co.

269—Coal-Burning Installation

"Burning Bituminous Coal the Modern Way," contains 24-pages of case histories from industries of all sizes and types. Engineering survey results for equipment such as boilers, stokers, coal and ash handling units, and automatic controls, in-

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NOTE—Each bulletin item has a key number for your convenience in asking for a free, personal copy. Circle key numbers on Reply Card between pages 34/35 & 98/99.

clude annual fuel consumption and operating costs. Bituminous Coal Institute.

270—Draft Inducers

The biggest contribution to the cause of improved furnace operation in recent years has been the mechanical draft inducer, according to 12-page booklet I-52. Six causes of poor chimney draft are listed. Parts of a typical draft inducer installation are numbered and explained. L. J. Wing Mfg. Co.

271—Packaged Steam Generators

Construction of packaged steam generators is described in eight-page bulletin 1050. Auxiliary equipment is listed and a blueprint with dimensions of a typical boiler room is given. Ames Iron Works.

272—Coal Handling Equipment

Applications of coal handling equipment for the power plant, pictured in 40-page brochure 2410, illustrates the cumulative experience gained in thousands of installations over more than 75 years. Drawings show tested layouts for various operating conditions. Link-Belt Co.

273—Tube Cleaners

Bulletin 43 introduces a new geared tube cleaner for removing scale in heat exchanger and condenser tubes of ⅝ to 2½ in. ID. The unit is said to be particularly effective where conditions require low speed and extreme power. The Airetool Manufacturing Co.

274—Boiler Gaskets

Easy-reference flange gasket and boiler gasket dimension tables and bolting data are included in catalog AG-953. Shown are types for raised face, smooth face, crane-lap, and Van Stone joints, flange unions, male and female joints, and tongue and groove fittings for all standard makes of boilers. United States Gasket Co.

275—Small Capacity Boilers

Small boilers available in 15 to 40 hp for heating and processing are introduced in four-page bulletin AD-134. Advantages such as the new hinged front and rear doors, forced draft air system, four-pass construction, and electric control panel are shown by means of drawings and photographs. Cleaver-Brooks Co.

276—Liquid Level Indicator

Do you have to guess at your boiler water level? Nineteen-page booklet WG 1824 describes the Yarway Remote Liquid Level Indicator and shows how it is used not only for boiler water indication but for feed water and deaerating heaters, expansion tanks, hot flow softeners, and other similar uses. Yarnall-Waring Co.

277—Boiler Cleaning

Four fact-filled pamphlets explain how this company's products will help you solve algae problems, increase boiler efficiency with use of the Ever Clean boiler process, remove rust, and prevent corrosion. North American Mogul Products.

278—Boilers and Equipment

Sixteen-page bulletin SB-50, "Erie City Boilers and Allied Equipment," describes custom designed steam generators for central station or industrial application. A number of water tube types available as well as a line of fire tube waste heat units are pictured in cross section. Erie City Iron Works.

279—Flue Dampers

Booklet 1-HEA on curtain type dampers for flue gas control explains what the damper is and does, construction, dimensions, installations, and gives case histories. Description and applications are treated completely. Booklet shows drawings and photos of a variety of damper types. Heacon, Inc.

AJAX SPIRAL WOUND GASKETS

AJAX SPIRAL WOUND GASKETS have built in resilience for positive seals with lighter bolt loads. The live spring action of the U-shaped metal plies lets these gaskets "breathe" with varying pressures and temperatures.

Multiple knife edges bite into flange surfaces. Each ply is a separate seal.

And AJAX Gaskets can be re-used because they don't lose their resiliency under compression.

Materials of construction meet all gasket requirements. Metals are plated low-carbon steel or stainless. Fillers include Canadian or blue African asbestos or chemically inert duPont TEFLON.

Sold through leading Industrial Distributors. Ask yours, or write for Catalog AG-953.

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FABRICATORS OF duPont TEFLON
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COMMERCIAL MUSEUM — PHILADELPHIA

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Concentrated under one roof you will see the newest improvements and refinements in power generation, transmission, utilization. Learn how these methods will help to modernize your power facilities —

The latest techniques for the maximum development and most economical utilization of power will be demonstrated by the skilled technicians manning every booth. Whether you are interested in mechanical, steam, electrical, hydraulic or pneumatic power, you will be sure to find ideas that will repay you many times over.

When going to the A.S.M.E. meetings, be sure to plan a stop-over at Philadelphia to see the Power Show.

PLAN NOW TO ATTEND

Write early for hotel reservations and advance registration

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bulletins

—Starts on page 94

281—Atomizing Oil Burners

The cheapest grades of oil or tar can be completely atomized and efficiently burned with Type SA steam atomizing oil burners according to 16-page bulletin 21. Models for various special uses are described. Furnace design and construction for efficient operation is stressed. National Airoil Burner Co., Inc.

282—Soot Blowers

Bulletin 1137 gives complete information on the Model G9B blower which employs a fixed position rotating element to clean a large number of tubes by sweeping through a pre-determined arc. The bulletin suggests the various uses for boilers, superheaters, reheaters, economizers, heat exchangers, and oil stills. The blower described is available for three pressure ranges up to and including 1500 psi. Diamond Power Specialty Corp.

283—Heavy-Oil Burner

Fuel savings is the theme of eight-page foldout AD-131 which describes the new "4" Hev-E-Oil burner. Illustrations show compactness and simplicity of design. Cleaver-Brooks Co.

285—Boiler Blowdown

"Boiler Blowdown Control," technical paper No. 128, is a reprint from **Industry and Power**, March 1954. Principal types of boiler blowdown are discussed, as well as various control methods necessary to assure production of pure steam and for keeping heat transfer surfaces free of scale and other objectionable deposits. W. H. & L. D. Betz.

BUILDING MATERIALS & MAINTENANCE

287—Thread Compound

A data sheet gives complete information on C-3 "Hi-Temp" tread compound. A sample will be sent along with the data sheet. Felt Products Manufacturing Co.

288—Flooring

"Handbook of Building Maintenance," gives valuable information on keeping your plant in efficient working order. Instant-Use concrete floor patch is described with suggestions for its use, along with other materials for repairing floors. Flexrock Company.

289—Repair Cements

Text and illustration in this 48-page handbook present repair methods for leaks in pipes, boilers, radiators, concrete, cinderblocks, and sheet and plate metal. Directory describes 12 repair cements and jobs they will do. Smooth-On Mfg. Co.

COMPRESSORS & BLOWERS

290—Compressors

Horizontal heavy duty air and gas compressors, Type T, are described in 15-page bulletin 728-S. Cross sections of crankshaft, inlet valve unloading system, compressor cylinder and valves, and the complete compressor add to the value of the booklet. Chicago Pneumatic Tool Co.

291—Rotary Compressors

Operation and construction of single-stage water-cooled rotary compressors and vacuum pumps, applicable to every air or gas handling requirement, are described in

12-page bulletin 16B8126. It gives general specifications along with typical air piping arrangement diagrams and proper accessories designed to give the most satisfactory results. Allis-Chalmers Mfg. Co.

CORROSION CONTROL

292—Rubber Linings

Application of rubber lining to prevent corrosion of tanks, pipes, and valves is discussed and pictured in four-page folder. In addition, two-page reprint tells how rubber lining can stop circulating pipe corrosion. La Favorite Rubber Manufacturing Company.

293—Transmission Line Corrosion

"Corrosion Control of Electrical Structures and Equipment," 17-pages, is designed to give the field operating men of electric light and power companies practical painting information on all phases of transmission and distribution work. Photographs are used to show the protection that can be expected from this company's paint products, Subox, Inc.

DIESEL & GAS ENGINES

294—Dual Fuel Engines

In 36-page bulletin S-500-B757 are photographic examples of each application, together with vital statistics, case histories, and comments on fuel consumption for dual fuel engines. Each feature is treated separately: the dual plunger fuel injection pump; automatic fuel switcher; automatic thermal air control; and the Micrometering gas valve. Worthington Corp.

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ELECTRICAL EQUIPMENT

298—Air Circuit Breakers

Bulletin 5107-DR-1 contains four pages of facts, figures, features, and photographs on types KA, KB, KC, and LG Urelite air circuit breakers, and on weatherproof and dust-tight enclosures. Applications, specifications, and construction details round out contents of booklet. I-T-E Circuit Breaker Co.

299—Mass Production Transformers

Power Transformers being built at the new mass production Rome, Ga. plant are described in 40-page booklet GEA-6108. It cites applications and features of standardized single phase and three phase units, ranging from 501 to 10,000 kva, and lists complete dimensions, ratings, and specifications. General Electric Co.

300—Dry-Type Transformers

"Latest Developments in Dry-Type Transformers," seven-page catalog 153-A, presents the advantages of air-cooled units designed and constructed primarily for inside installations. Various types are shown with specifications. Sorgel Electric Company.

301—Renewable Fuses

Sixteen-page bulletin S-40 describes the Economy DeLay renewable fuses which are said to give safe and dependable time-delay on overloads. For every requirement, these fuses have inexpensive links which are easily replaced. Economy Fuse & Manufacturing Co.

302—Power Factor Correction

Booklet 50B, 27 pages, describes the Unit-Cell Box Type Capacitors which offer

(Continued on page 102)

NATIONAL AIROIL

OIL BURNERS
of the steam and mechanical types now combined into
DUAL STAGE BURNERS

PATENT PENDING

Now, at last, the inherent advantages of *both* systems of fuel oil atomization are *profitably* yours . . . within the one, new NATIONAL AIROIL Dual Stage Burner.

42 years of combustion equipment design and manufacture are in back of the Dual Stage Oil Burner . . . and, it has been thoroughly tested and proved in the field for firing: Petroleum Processing Heaters; Rotary Kilns; H.R.T., Scotch Marine and Water Tube Boilers; etc.

Available in three sizes, the NATIONAL AIROIL Dual Stage Burner fires all grades of fuel from No. 2 to No. 6, with a ready capacity of 80 to 300 g.p.h. Further, for a perfect flame pattern, we would recommend using with the Dual Stage Burner either the NATIONAL AIROIL Universal Register for forced draft or, the NATIONAL AIROIL Tandem Unit for natural or induced draft furnaces.

Get detailed description, illustration, and specifications in NATIONAL AIROIL Bulletin 25.

OIL BURNERS and GAS BURNERS for industrial power, process and heating purposes
STEAM ATOMIZING OIL BURNERS
MOTOR-DRIVEN ROTARY OIL BURNERS
MECHANICAL PRESSURE ATOMIZING OIL BURNERS
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OBSERVATION PORTS
SPECIAL REFRACTORY SHAPES
LOW AIR PRESSURE OIL BURNERS
AUTOMATIC OIL BURNERS, for small process furnaces and heating plants
GAS BURNERS
COMBINATION GAS & OIL BURNERS
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INDUSTRIAL OIL BURNERS, GAS BURNERS, FURNACE EQUIPMENT

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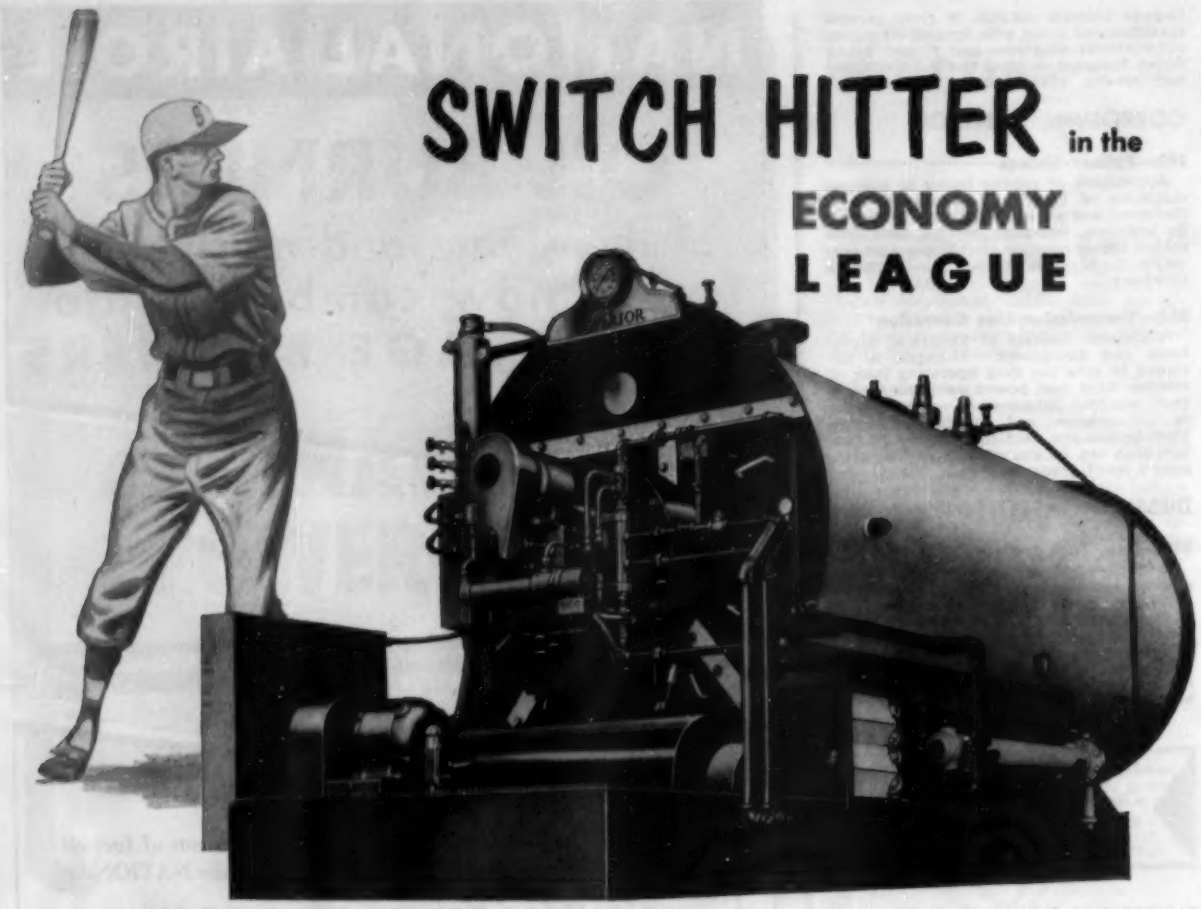
SWITCH HITTER in the ECONOMY LEAGUE



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STEAM GENERATORS

Just as the switch hitter changes his batting stance to take full advantage of the pitching situation, Superior Steam Generators change fuels to take advantage of the price situation. When equipped with combination gas/oil burners, Superior Steam Generators switch from one fuel to the other quickly, and without dismantling the equipment or interrupting the steam supply.

Superior Steam Generators are completely factory-assembled and fully tested prior to shipment for guaranteed performance exceeding 80% thermal efficiency, fully automatic . . . burning oil or gas . . . and are available in 18 sizes from 20 to 600 b.h.p. for pressures to 250 p.s.i. or for hot water. For complete details write for catalog 602

for performance you can **BANK** *on*

SUPERIOR
STEAM GENERATORS

SUPERIOR COMBUSTION INDUSTRIES INC.
TIMES TOWER, TIMES SQUARE, NEW YORK 36, N.Y.

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readers' guide

. . . an index to advertised products

The table below lists, according to product groupings, all equipment advertised in this issue. To request more data, circle key numbers on Reply Cards, pages 34/35 & 98/99

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For what purpose do you use flexible metal hose? To control expansion, contraction, vibration . . . to solve a misalignment, a conveying problem?

Whatever your application, you are buying flexible service. For your dollar's sake, it is well to know that Atlantic metal hose returns more flexible service than any other hose. Your own performance records will prove it.

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Manufacturers of Seamless and Interlocking Flexible Metal Hose in Steel, Stainless Steel, Monel, Bronze . . . Sizes ⅛"-36" I. D. with appropriate fittings.

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METAL HOSE CO. INC.
324 Dyckman St.,
New York 34, N. Y.

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names make news

. . . personalities from industry and power

Federal Electric Products Co. has changed its name to **Federal Pacific Electric Co.** upon merger with Pacific Electric Manufacturing Corp.

The Cooper Alloy Foundry Co. announces appointment of **Arthur Tauscher** as plant engineer in charge of maintenance and construction.

General Electric Co.—M. N. Halberg formerly with the Industrial Engineering Section, is named application engineer of the Large Motor and Generator Dept.

Chain Belt Co. — William H. Brandt retires after more than 44 years of service with the company. He held the position of assistant secretary from 1926 until his retirement this year.

Lincoln Electric Co. has elected **William Irrgang** president and general manager of the company. **James F. Lincoln** is chairman of the board and **John C. Lincoln,** founder of the company, is elected honorary chairman of the board and treasurer. **John S. Roscoe** becomes executive vice-president; **A. F. Davis,** vice-president and secretary; **George Landis,** vice-president.

American Blower Corp.—C. C. Fuller is elected vice president-treasurer and **Arthur V. Lafave** is assistant treasurer and assistant secretary.

Johns-Manville Corp.—advancements for engineering personnel include: **George S. Smith,** director of engineering and vice-president of Johns-Manville Products Corp.; **Arthur C. Smith** as chief plant engineer in the General Engineering Dept.; and **Donald E. Hillier,** production manager of the J-M Building Products Div.

Westinghouse Electric Corp.—Marshall N. Waterman, assistant manager of the Westinghouse Lamp Division's commercial engineering department is elected vice-president of the Illuminating Engineering Society.

Byron Jackson Co. announces that its wholly-owned subsidiary, Byron Jackson Co., S.A., a Mexican Corporation, is now manufacturing deep-well turbine pumps in its recently acquired plant outside Mexico City.

Patterson-Kelley Co. appoints **Lawrence W. Bergheimer** to the position of general superintendent, in charge of all plant operations.

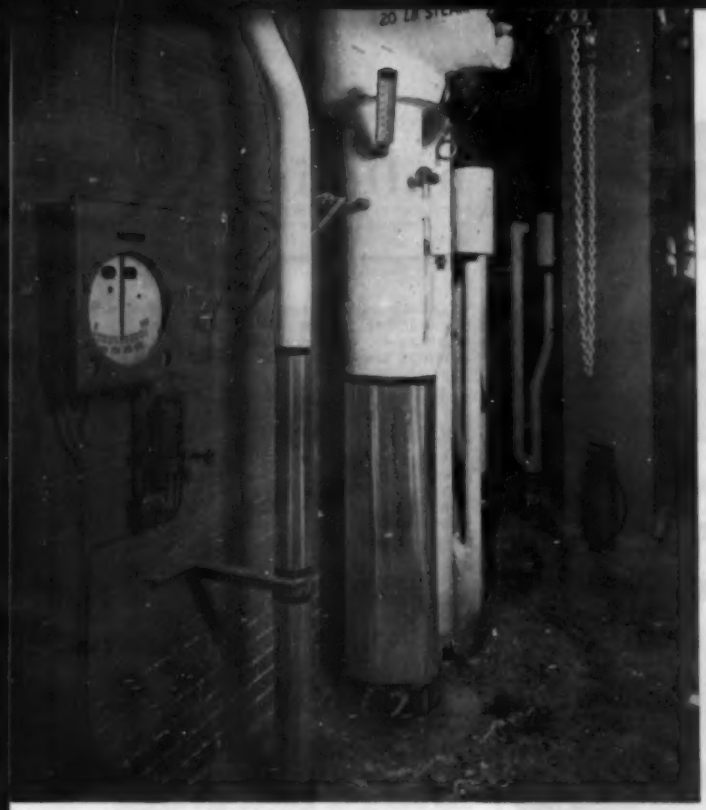
Bergheimer **Termini**

The Permutit Co. announces the addition of **John P. Termini** to its Special Applications Dept.

Cooper-Bessemer Corp. announces formation of three primary engineering divisions; Development Div., Technical Div., and Product Div. Chief engineer of Development is **W. R. Crooks; Dennis L. Gallogly** is chief engineer of Products; and **T. O. Kuivinen** chief engineer of the Technical Div. The engineering organization plan will be headed by **R. L. Boyer,** vice-president and chief engineer. Programs of the three divisions will be coordinated by **E. Frederick,** executive engineer.

VISITOR FROM JAPAN

T. Kurai, president of Niigata - Worthington, Ltd., of Japan, is shown operation of a large centrifugal refrigeration compressor on test, by S. Riley Williams, vp of Worthington Corp., during Mr. Kurai's visit to the parent company's N.J. Works. The Japanese company produces compressors and pumping equipment for Japanese industries



PROBLEM: High maintenance cost of canvas jacketing. High-pressure hot water hose used to clean floor damaged lower ends of lines and necessitated constant replacement.

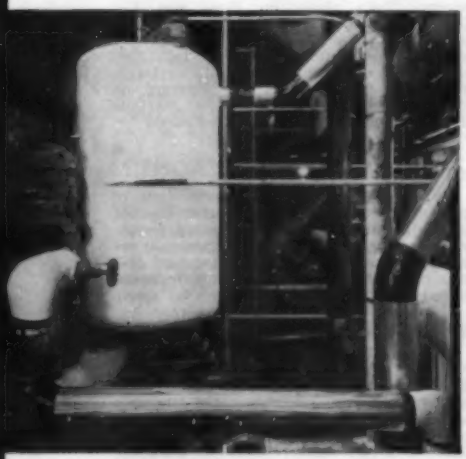
SOLUTION: Childers Aluminum Jacketing replaced canvas. Waterproof—easy to install—reusable.

PROBLEM: Extreme hazard of fire from static electricity generated in machinery. Canvas jacketing could burn easily causing danger to men and machinery in plant.

SOLUTION: Childers Aluminum Jacketing installed. Fireproof—easily cleaned of oil to reduce fire hazard.

Do Insulated Lines in Your Plant Cause These Three Common Problems and Hazards?

Read How Special Aluminum Jacketing Solved Them for Scott Paper Company



PROBLEM: Costly replacement of insulated lines damaged by oil drippage and bumping by men and tools.

SOLUTION: Maintenance engineers replaced canvas jacketing with Childers Aluminum Jacketing. Easy to wipe clean . . . durable and resistant to abrasion and abuse. Maintenance cost reduced.

The Scott Paper Company, Chester, Pa., and nearly 1,000 other modern plants in this country have protected insulated lines with Childers Aluminum Jacketing.

Childers Aluminum Jacketing cuts maintenance costs. It needs no upkeep . . . retains its protective value for years. Because Childers Aluminum Jacketing needs no painting, it can actually pay for itself in this saving alone. And of course, this modern aluminum jacketing can be removed and replaced easily for line repairs.

Easy installation cuts cost even farther. Only tools needed are pliers and wedge. Economical strapping holds jacketing securely—allows easy removal.

Try this low-cost protection in your plant. Write today for engineering data and information about how you can order a 400 sq. ft. roll to test on one of your insulated lines. No obligation. For full details write to: Childers Manufacturing Company, Department IP-1, 3620 West 11th Street, Houston 8, Texas.

SPECIFICATIONS

Childers Light-Weight Aluminum Jacketing

Shipped in rolls. 4 ft. wide; 100 ft. long with or without moisture barrier. Aluminum of .006" thickness. Cut with straight edge and dull knife. Write now for full details and engineering data.

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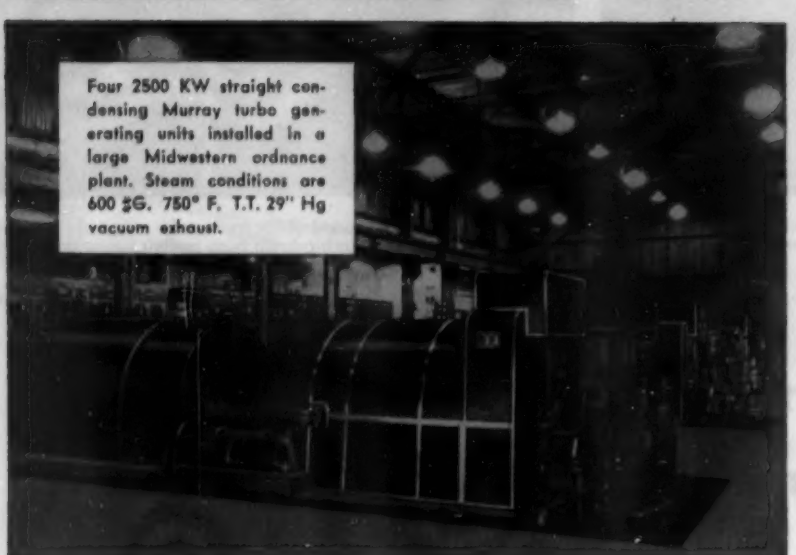
LOW COST Childers Aluminum Jacketing answers many problems in plants all over the country. It's light weight, easy to install—goes on with simple bands. Weather, water, heat and fire resistant—can be used and re-used for years.

(Advertisement)

Murray Turbines



Four 2500 KW straight condensing Murray turbo generating units installed in a large Midwestern ordnance plant. Steam conditions are 600 #G. 750° F. T.T. 29" Hg vacuum exhaust.

Murray Turbo Generator units can be furnished to meet your special requirements in sizes up to 3000 KW. Condensing and non-condensing types with or without extraction and/or mixed pressure features can be furnished Whether you require a small inexpensive standby unit or a highly efficient, and reliable source of power, Murray has a design to fit your needs.

Consult your local Murray representative who will gladly help you select the unit most economically suited to your conditions.

MURRAY IRON WORKS COMPANY
BURLINGTON, IOWA

BUILDERS OF STEAM POWER EQUIPMENT FOR THREE QUARTERS OF A CENTURY

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bulletins

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easy-to-install, economical means of correcting low power factor for large or small power consumers. Typical wire connections are shown. Sprague Electric Co.

ELECTRIC UTILIZATION

303—Motors

Advantages of the various types of motors made by this company are given in four-page folder 23. Descriptions of single-phase and polyphase motors are included along with a listing of their specifications. Wagner Electric Corp.

304—Variable Speed Motors

How variable speed motors are used to improve production is described in 16-page brochure 1797. In addition to describing advantages the booklet describes design theory and construction features. Special controls, including both mechanical and electrical types, also are discussed. U. S. Electrical Motors, Inc.

305—Motor Control Center

Savings in space and expense and improved performance is explained in 12-page bulletin 170. Electrical and constructional details of these groups of combination rhotor starters and their components are fully described. Arrow-Hart & Hegeman Electric Co.

HEAT EXCHANGERS & WATER HEATERS

306—Injection Water Heaters

Steam injection water heaters with the pressurizer piston for safe, quiet, automatic control are described in four-page pamphlet WH12A. How the unit saves space, time, fuel, installation, and maintenance costs is explained. Specifications for the seven standard sizes—for both direct and accumulator application—are given in tables. Pick Manufacturing Co.

307—Pipe and Fin Coils

Revised second edition of the "Engineering Data Book on Pipe and Fin Coils" contains such information as calculation of pipe and fin coils, heat transfer coefficients for heating or cooling, factors for computing fin coil surfaces, recommended materials for heating or cooling, heat transfer factors at various air velocities, and Btu load limitations for cooling coil circuits. Rempe Co.

308—Heat Exchangers

Bulletin 120 describes the operation of the Aero Heat Exchangers used in cooling or controlling of temperatures of industrial liquids. It shows the operation of this equipment by means of diagrams and examples of application by installation photographs. Niagara Blower Co.

309—Unit Heaters

Catalog CUH 846-A gives the complete story on Grid unit heaters. Catalog BC-1040 describes Grid blast coils for process drying. How the construction of the unit heaters prevents electrolytic corrosion is explained in booklet "Corrosion in Unit Heaters." D. J. Murray Manufacturing Co.

310—Water Heaters

A streamlined system of heating water and process liquids quickly and at low cost is explained in this bulletin. The Instant Heater described eliminates the need for reducers. Cross-sectional drawings explain how unit operates. Johnson Corp.

311—Heaters

Horizontal and vertical heaters in steel, copper lined, copper-silicon, cement lined, clad and galvanized construction, as well as the low-flow design are each cataloged as to weights, dimensions, construction details, and capacities—with conversion tables, in 48-page catalog 18. The Patterson-Kelley Co., Inc.

INSTRUMENTS & CONTROLS

312—Gage Catalog

The four important questions to ask before you buy gages are listed in comprehensive 68-page catalog 64. Whether you need gages for replacement on operating equipment or for installation on new equipment, you will find complete information with drawings and specifications in this booklet. United States Gauge Div., American Machine and Metals Inc.

313—Temperature Regulators

Bulletin 330 fully describes a simple, self-operating temperature regulator for plating, anodizing, bonderizing, pickling, cleaning and rinsing solutions. The Powers Regulator Co.

314—Flow Meters

Important data on the Diaflow Meter, for measuring air flow, gas flow, and the ratio between the two flows, are presented in eight page booklet 52-1017-37. According to the booklet, the meter is particularly well suited for industrial furnaces and also for sewage disposal plants. The Hays Corp.

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315—Temperature Regulators

Recommended installations of temperature regulators for instantaneous water heaters, storage water heaters, and forced air heating systems are shown in three line drawings in four-page folder 1008. Spence Engineering Co., Inc.

316—Temperature and Pressure Control

Through years of experience in instrument design and manufacture, this company has developed a specialized line of equipment for the recording and indicating of temperature and pressure to fill your specific requirements. Seven-page bulletin G-158-A shows typical examples of such equipment with lists of specifications. The Electric Auto-Lite Co., Instrument and Gauge Div.

LUBRICATION

317—Force Feed Lubricator

Automatic force feed lubricator Model "94" described in 11-page booklet 94-C will pump against any steam or air pressure up to 1500 lb and will handle any grade of oil from the lightest mineral to the heaviest cylinder stock. Manzel Div. of Frontier Industries.

318—Petroleum Products

Brief descriptions of the leading products this company produces for industrial use are given in folders A-2894 and A-2951. These products include hydraulic oils, metalworking coolants, heat transfer oils, and many others. Sun Oil Co.

319—Non-Fluid Oil

This constructive bulletin explains the uses and advantages of Non-Fluid Oil. According to this booklet, it cannot clog fittings, it lubricates until entirely consumed, and will not separate under pres-

"SMALL SIZE... BIG RESULTS!"

Expanding blade type head with No. 29 motor
Drill head and universal joint
Brush type head
Single unit head, universal joint type

Keep condenser, heat exchanger and other small tubes free from scale or sludge and at peak efficiency with

AIRETOOL MIGHTY MIDGETS

Airetool small tube cleaners are designed to make it easier to thoroughly remove hard or soft foreign deposits of any type from condensers, heat exchangers, or other small diameter tubular equipment; quickly and with maximum safety to inside tube surfaces.

Used with either flexible drive or a universal joint, and powered by husky air-driven Airetool motors, these small cleaner heads quickly remove foreign deposits from straight or bent tubes of ⅝" to 2" I.D.

AIRETOOL CONDENSER TUBE CLEANERS

Every type of heat exchanger and condenser tube, even those completely plugged, can be quickly cleaned by powerful Airetool outside mounted air-driven cleaners. Geared or direct-drive — positive handle control valve; drill is cooled by positive flushing system . . . sound deadening muffler.

Get full information on Airetool equipment for your own industrial needs. Write The Airetool Mfg. Co., 318 S. Center St., Springfield, Ohio.

BRANCH OFFICES: New York • Philadelphia • Chicago • Houston • Tulsa • Baton Rouge

Representatives in all principal cities of U.S.A., Canada, Mexico, South America and England.

There's An Airetool Tube Cleaner and Tube Expander for Every Type of Tubular Construction.

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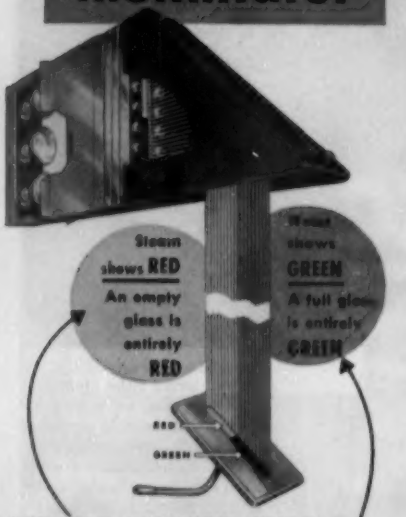
DIAMOND BI-COLOR WATER GAUGE with "HI-LITE" Illuminator



YOU'RE ALWAYS SURE WITH *Bi-Color*

There is no guessing about boiler water level when you use the Diamond Bi-Color Water Gauge. It makes use of an unvarying optical principle (the difference in refraction between water and steam) to always show water green . . . steam red. With proper illumination, the water level is unmistakable . . . whether viewed directly . . . through a system of mirrors . . . or on control panel by the use of Diamond "Utiliscope" (Wired Television).

A big improvement over other light sources, the "Hi-Lite" Illuminator uses standard high-intensity lamps similar to automobile "sealed beam" headlights. The gauge will thus retain visibility with much longer time between gauge cleanings. Use the coupon below for further information.

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Please send me without obligation a copy of new Bulletin No. 1051 explaining the advantages of Diamond Water Gauges and Water Columns.

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ADDRESS_____

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LANCASTER, OHIO
Diamond Specialty Limited—Windsor, Ont.

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bulletins

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sure. A free testing sample of the oil will be sent with the literature. New York & New Jersey Lubricant Co.

320—Oil Reclaimer

Subject of four-page folder R-247 is a self-contained, compact oil reclaimer for keeping industrial oils free from contaminants. In addition to describing how the process works, the bulletin suggests applications. The Hilliard Corp.

321—Oil Filters

'Filters and Purifiers for Oil Circulating Systems,' 16-page reprint from the magazine "Lubrication" for March, 1954, discusses the contaminants encountered with oils in service and the deterimental effects associated with them. Oil oxidation and extraneous matter is listed. Selection of equipment and maintenance of the various types is fully discussed. The Texas Co.

MATERIALS HANDLING & STORAGE

322—Storage Bins

If you specify vertical storage construction for handling flowable bulk materials, this ten-page foldout will help you visualize how this company's Super-Concrete Stave Storage Bins might meet your requirements. The booklet contains photographs of typical installations and explains construction. The Neff & Fry Co.

METALS & WELDING

323—Steel Weldments

New close-tolerance machinery illustrated in this four-page folder makes it possible for this company to produce single components or complete assemblies to your plant's specification. Examples of equipment designed and engineered by this company are also given along with suggestions as to cast parts that can be replaced by fabricated steel weldments. The Foster Co.

324—Nickel Alloys

Helpful technical publications covering the many aspects of nickel alloys, and their applications, are listed in two bulletins. Instructions on how to order literature, free of charge, are included. The International Nickel Co., Inc.

PIPING, VALVES, & SPECIALTIES

326—Valves

Needle, globe, plug, check, relief, and special valves are described in 44-page catalog 352A. Units listed are made of various metals, and are suitable for instrumentation, processing industries, hydraulic systems, and industrial applications. Details of construction are shown, and complete specifications and dimensions are given. Republic Manufacturing Co.

327—High and Low Pressure Valves

Catalog 10 describes List 900 and 990 valves. The 900 is for a pressure range of 2000 lb at 100 F to 380 lb at 1000 F. The 990 is for higher pressures. According to the booklet, these valves offer extra protection against excessive stress with extra-strong stem and wedge-gate connection. Chapman Valve Manufacturing Co.

A Boon to Your Pipe Lines and Ducts

- **POSITIVE CONTROL**
- **INSTANT RESPONSE**
- **TIGHT SHUT-OFF**

This W. S. Rockwell Butterfly Valve handles gases at 10 p.s.i. and 150° F. maximum. It is fitted for precise, automatically controlled fluid flow and shut-off.

W. S. Rockwell Valves are made in pipe sizes to 132", of any metal or rubber-lined, with any automatic or manual operator. They are designed to meet required operating conditions in handling air, gases, liquids, semi-solids, at temperatures to 2000° F. and pressures to 300 p.s.i. and higher.

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BUTTERFLY VALVES • SLIDE VALVES • AUTOMATIC VALVES

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Sales Representatives in Principal Cities

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329—Reducing Valves

Four-page folder 511-A lists actual small flow reducing valve capacities based on test data. Cross-sectional drawings show construction of the bronze and steel valves. Leslie Co.

330—Rubber-Lined Pipe Joint

Nine-page handbook presents basic principle, design features, method of installation, plus parts and tools needed to utilize the Gaco rubber-lined pipe system. It compares cost of Gaco and flanged pipe installations. Gates Engineering Co.

331—Flow Meters

With an alarm control, the flow meters described in this bulletin have only three moving parts. How they operate to ring a bell, light a light, or activate a motorized valve is explained by means of illustrations. Henszey Co.

332—Regulating Valves

Bulletin 1-A, 52 pages, gives complete information on a wide range of regulating valves for steam, water, air, gas, or oil. Illustrations, cross-sectional drawings, and specifications are included. Atlas Valve Co.

333—Prefabricated Conduit System

Introduced in four-page folder 5210 is a newly developed large diameter, prefabricated conduit system for protection of underground services. Prefabricated to job requirements, it contains piping for steam, condensate, water lines, fire lines, or process purposes all in place and insulated where required. The Ric-wiL Co.

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Torque Wrenches

Both inch-pound and foot-pound torquers are described in this complete 68-page catalog. Types included are for a wide range of drive sizes with plain or ratchet head. **Please send requests directly to Proto Tool Co., Dept. IP, 2262 Santa Fe Ave., Los Angeles 54, Calif., with 10c.**

334—Trapping Practice

Engineers concerned with steam traps should find 48-page catalog *J* a valuable source of data on recommended trapping practice. In addition to explanation of how to calculate condensate loads and select traps, a maintenance section covers installation, preventive maintenance, trouble shooting, and repair. Armstrong Machine Works.

335—Valve Catalog

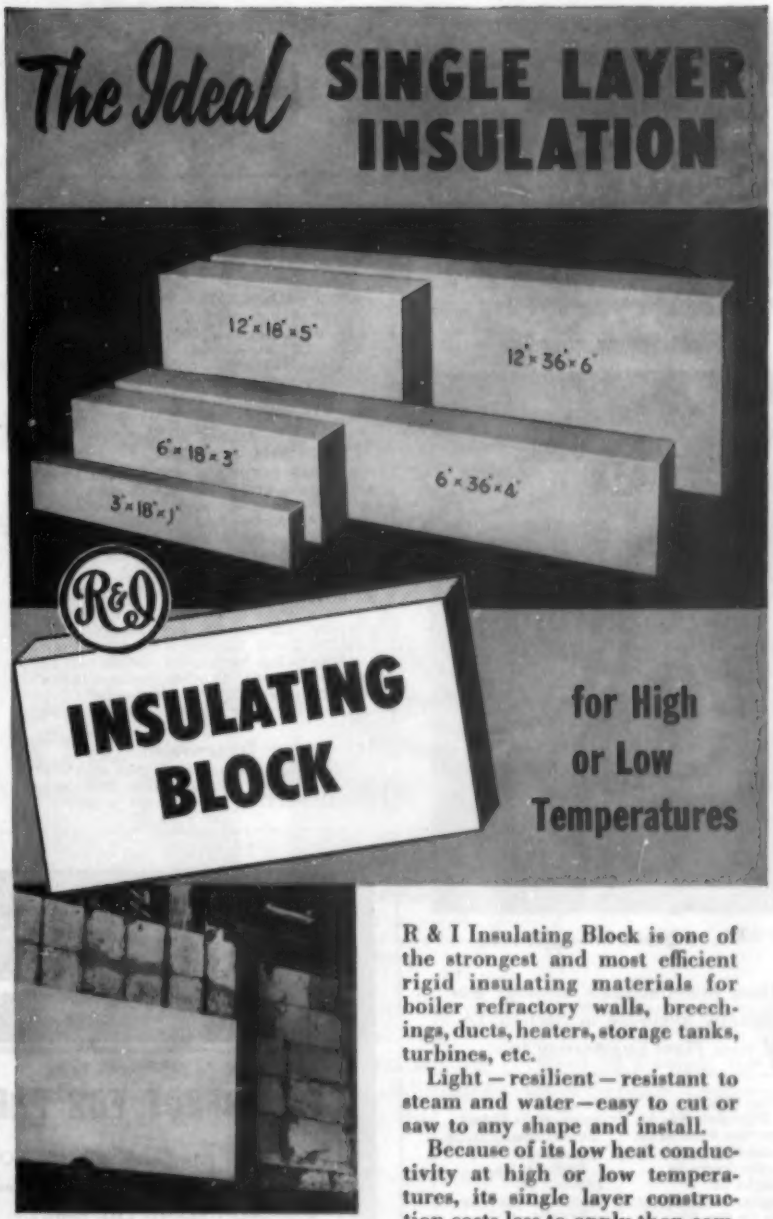
The various types of valves made by this company are pictured by means of blue-print drawings, cross sections, and photographs in bulletins 500—505, 508, and 600. Complete dimensions are listed in tables. W. S. Rockwell Co.

336—Pressure Pipe Coupling

Ring-Tite, the new coupling for Transite Pressure Pipe, is the subject of six-page folder TR-142A. It shows how the coupling goes together, points out installation time savings, and explains economies in service. Johns-Manville Corp.

337—Tank Calculator

Hydro-pneumatic tank calculator tells you instantly the best air-water ratio, most efficient pressure differential, exact amount withdrawn on any pressure drop, and resultant reserve. Printed on heavy board, the calculator operates on a slide rule principle. Automatic Control Co.



R & I #14 Block applied to refractory tile of boiler wall.

R & I Insulating Block is one of the strongest and most efficient rigid insulating materials for boiler refractory walls, breechings, ducts, heaters, storage tanks, turbines, etc.

Light — resilient — resistant to steam and water — easy to cut or saw to any shape and install.

Because of its low heat conductivity at high or low temperatures, its single layer construction costs less to apply than combination or two-layer insulating blocks.

There are 3 TYPES

R & I Mineral Wool Block—for temperatures to 1200° F.

R & I #14 Insulating Block—for temperatures to 1400° F.

R & I #18 Insulating Block—for temperatures to 1800° F.

Available in thickness from ½" to 12" and sizes from 3" x 18" to 12" x 36". Prompt delivery.

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REFRACTORY BONDING AND CASTABLE CEMENTS
INSULATING BLOCK, BLANKETS AND CEMENTS

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material handling equipment?

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Plant Engineering File

"...a great time-saver"

These manufacturers' catalogs are instantly available in Section 1A of your Plant Engineering File:

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American Monorail Co.	Hough, Frank G. Co.
Baker-Raulang Co.	International Nickel Co.
Barber-Greene Co.	Lewis-Shepard Products, Inc.
Bassick Co.	Link-Belt Co.
Beacon Machinery, Inc.	Mechanical Handling Systems, Inc.
Big Joe Mfg. Co.	Rapids-Standard Co.
Buell Engineering Co.	Richards-Wilcox Mfg. Co.
Chisholm-Moore Hoist Corp.	Sauerman Bros., Inc.
Clark Equipment Co.	Standard Conveyor Co.
Cleveland Crane & Engrg. Co.	U. S. Rubber Co.
Faultless Caster Corp.	Wright Hoist Div.

In other sections of the File you will find additional catalogs containing useful information on a wide range of products used in the maintenance of all plant facilities.

Sweet's Catalog Service

Division of
F. W. Dodge Corporation
119 West 40th Street,
New York 18, N. Y.

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bulletins

—Starts on page 94

POWER TRANSMISSIONS — MECHANICAL

339—Belt Conveyor Design

Engineering data required to design a belt conveyor for any application are presented in 86-page catalog 852. The booklet, published to serve as a handbook on conveyor design, states that many problems can be answered by using a standardized unit. The Jeffrey Mfg. Co.

340—Flexible Couplings

Flexible couplings which never require lubrication are shown in 19-page bulletin 1000. Valuable engineering data for each type of coupling are given in table form along with drawings and application. Lovejoy Flexible Coupling Co.

342—Eddy-Current Machinery

"Basic Principles of Eddy-Current Machinery," a section of 15-page bulletin GBI, explains the fundamental principles of generating torque by means of eddy-current devices. Another section, "Characteristics of Rotating Equipment," contains engineering data. Dynamatic Corp.

343—Power Transmission

Eight-page foldout describes a new concept of power transmission—the Poly-V Belt Drive. This drive is said to be a solution to matching problems and to provide greater changeability. Manhattan Rubber Div. of Raybestos-Manhattan Inc.

PUMPS

344—Opposed Impeller Pump

How opposed impellers balance axial thrust is covered in 12-page brochure 1502. Sizes from 2 to 4 in., with 2 to 8 stages, are presented for capacities to 1000 gpm, pressures to 1200 psig, and temperatures to 350 F. DeLaval Steam Turbine Co.

346—Packings

Darcova pumcups, which permit equipment to be operated at reduced speeds, are described in two bulletins: No. 4502 on Pumcups for air or hydraulic mechanisms; and 4401 on units for reciprocating pumps. How these units decrease maintenance and lower operating costs is described. Darling Valve & Mfg. Co.

348—Non-Clogging Pumps

Type U non-clogging pumps designed for handling liquids carrying large amounts of solids and foreign materials are described in 11-page bulletin 730-C. The specific uses of each type pump are given along with tables to help in selection. Cross-sectional drawings are used to present special features of different types. Weinman Pump Manufacturing Co.

350—Proportioning Pumps

Design of the "K" pump, the result of long experience in the solution of proportioning problems, is shown in detail by means of a two-page foldout in five-page bulletin KP-54. Capacity and pressure tables will help you choose the pump for your particular requirements. Hills-McCanna Co.

NON-FLUID OIL
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PERFECT FOR PRESSURE SYSTEMS!

Pressure lubrication calls for NON-FLUID OIL—a modern lubricant that can't dry out like ordinary greases and will not separate under pressure. NON-FLUID OIL lubricates all the way, until entirely consumed.

NON-FLUID OIL contains nothing of a residual nature that can clog fittings, causing bearings to run dry. Why *choke* your pressure system? Switch to NON-FLUID OIL and see for yourself why NON-FLUID OIL is perfect for pressure systems.

Write now for free on-the-job sample for testing and a useful bulletin.

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NON-FLUID OIL is not the name of a general class of lubricants, but is a specific product of our manufacture.

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353—Turbo Pump

Each component of the type DE turbo pump is pictured and its design advantages explained in a six-page folder. The lubrication system is also described in detail. Typical uses are listed. The J. S. Coffin, Jr., Co.

354—Pump Package Systems

This catalog describes pump package systems including welded steel tanks in standard sizes of 50, 100, 175, 250, and 500 gal complete with all accessories. The Manajust Stroke adjustment for varying capacity when pump is not operating, and the Autajust for precise control of flow while pump is running are explained. Orchem Pump Div.

REFRACTORIES & INSULATION

355—Refractories

Charts which show at a glance the properties of refractory castables, plastics and mortars are featured in 20-page catalog R-22. Important information including recommendations for each is presented. Babcock and Wilcox Co., Refractories Div.

356—Refractories & Insulation

Catalogs R-52 through L-93, compiled in a binder, form an illustrated 40-page booklet showing where, when, and how to use various types of materials for industrial heat generation and processing equipment. An index is included for quick reference. Refractory & Insulation Corp.

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359—Aluminum Jacketing

One of the most frequent problems in the use of aluminum jacketing on insulated lines is how ells, tees, and bends should be weatherproofed. Data Sheet E-130 answers this question with a drawing which shows three practical methods for this part of the job. Childers Manufacturing Co.

363—Industrial Insulation

"J-M Products for the Process Industries," eight pages, is arranged as a ready reference for men responsible for the design, installation, and operation of process equipment. It gives concise data on the properties of the various products and includes photographs showing typical installations. Johns-Manville Corp.

TURBINES & STEAM ENGINES

360—Steam Turbines

If you use steam for heating, cooking, or processing, you can get power at almost no cost with the use of a Wing steam turbine according to bulletin SW-1a. Construction of these units gives an almost infinite range of speeds, easy control by throttling, and the units are independent of any electric power failure. L. J. Wing Mfg. Co.

361—Steam Turbines

Fully-illustrated 24-page bulletin 1961 emphasizes the flexibility of design of the Type-S turbine which is said to make possible selection of the proper number of stages, governor, and controls to give maximum efficiency for your steam and operating conditions. Worthington Corp.

362—Multi-Stage Turbines

Smaller framed, multi-stage turbines are featured in six-page bulletin. Overspeed governor, governor valves, blades, dia-

Laboratory demonstration shows foaming of highly alkaline solution in glass test cylinder.

Same solution after addition of 12 ppm of Bird-Archer Concentrol antifoam.

CONCENTROL

LOW COST CHEMICAL METHOD

FOR CONTROLLING FOAM

AND BOILER WATER CARRYOVER

LABORATORY PROOF

Tests and plant operating records in all parts of the country have established the effectiveness and economy of Concentrol chemical treatment to combat wet steam problems. Where boiler water carryover is caused by foaming due to high alkalinity and high proportion of dissolved solids in the water, Concentrol is essentially a surface active agent that causes breakdown of bubble film, preventing foam formation.

Concentrol is supplied in liquid, powder or briquette form—can be fed either continuously or in slugs to boilers. Formulations of Concentrol can include organic sludge conditioning agents and other water treatment chemicals for boiler treatment as well as antifoam. Concentrol eliminates the need for costly pre-treatment of water and high blow-down rate. It is fast acting and resistant to hydrolysis or breakdown under normal boiler temperatures and pressures.

A Bird-Archer 8 Point Service Engineer is as near as your phone. For friendly counsel call him or write directly to Bird-Archer outlining the details of your boiler operations.

Engineering plus Chemistry equal Bird-Archer Service

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THE BIRD-ARCHER COMPANY, 4337 NORTH AMERICAN ST., PHILADELPHIA 40, PA.

NEW YORK • CHICAGO

IN CANADA: The Bird-Archer Co., Limited, Cobourg, Ontario

IN MEXICO: Calderas y Accesorios, S. A., Amsterdam 291, Mexico, D. F.

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bulletins

—Starts on page 94

phragms, and many other design features are discussed and illustrated. The Terry Steam Turbine Co.

364—Turbine Speed Control

"Fundamentals of Turbine Speed Control," 32-page brochure H-21, is an educational piece intended to clarify the operation of common types of automatic speed control for steam turbines. Simplified diagrams illustrate operating principles of actual control systems. Elliott Co.

365—Steam Turbine Selection

Full details of this company's steam turbine are given in bulletin 135. Drawings and installation photographs point out the special features. How to save operating and maintenance costs by buying the right size for individual needs is explained. Coppus Engineering Corp.

WASTE DISPOSAL

366—Waste Treatment

How this company has solved waste treatment problems for such industries as electro-plating, refinery, gas, and metal finishing is treated in detail in six-page booklet 70-B. Cross-sections show the various types of chemical and biological treatment equipment. A handy bibliography serves as a reference for more information on waste treatment in each of the industries covered. Infilco, Inc.

WATER TREATMENT

367—Water Analysis

Published by a company engaged exclusively in the solution of industrial water conditioning problems, this 14-page brochure contains brief descriptions of testing and control equipment necessary for the more common water analyses. W. H. & L. D. Betz.

368—Water Purification

"Boiler Feedwater Treatment," 19-page bulletin BFT-1, covers Inversand zeolite softeners, color process chemical softeners, and demineralizing units, including silica removal by ion-exchange. Each process is explained by means of chemical formulas and flow diagrams. Hungerford & Terry, Inc.

369—Ion Exchange Material

Strongly basic anion exchanger is presented in 16-page bulletin 57. Includes complete data on physical characteristics, exchange capacity and regeneration technique. Tables and graphs along with discussions explain performance under various conditions. National Aluminate Corp.

370—Diatomite Filters

How filtration of water, or other liquids for industrial use, can be obtained simply, economically, and efficiently by means of this company's diatomite filters is described in Bulletin WC-115. Text, photographs, and schematic diagrams show typical arrangements of the unit. Graver Water Conditioning Co.

371—Mixed Bed Demineralizing

"Automatic Mixed-Bed Demineralizing at the Albany Steam Plant," eight-page bulletin 3963 tells the story of the first fully automatic mixed-bed equipment to produce make-up water. A table shows the comparative cost of an evaporator plant and a demineralizer. The Permutit Co.

372—Water Conditioning

Conditioning for boiler, process, and general application is discussed in 20-page booklet 611A. A zeolite unit for manual and automatic operation is featured. In addition, chemical feed, zeolite-post treatment, zeolite-alkalinity neutralization, split-stream, and anion exchange dealkalization systems are explained. Elgin-Refinite Div. of Elgin Softener Corp.

374—Ion Exchangers

This 14-page booklet reviews generally the subject of ion exchange, established and potential applications. It gives advantages of the synthetic ion exchange resins and a bibliography of papers concerning their use. Rohm & Haas Co.

376—Water Softener

ZEO-FLO Sodium Zeolite Softener, a water softener specially designed for small and medium size industrial plants, laundries, and hospitals, is described in four-page folder 4505-A. How the softener has been simplified so that installation may be handled readily by the facilities of a small or medium sized plant is explained. Cochrane Corp.

377—pH Control

"Automatic pH Control in Water and Industrial Waste Treatment," eight pages, is a reissue of a paper delivered by R. T. Sheen, president of this company. Outlined are several typical systems of automatic pH control in boiler feed water treatment, using air- and motor-operated valves as well as controlled volume pumps to effect proper addition of chemicals. Milton Roy Co.

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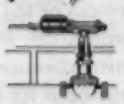
Port-A-Pony will drive low speed winches used to pull electric cable through conduit?



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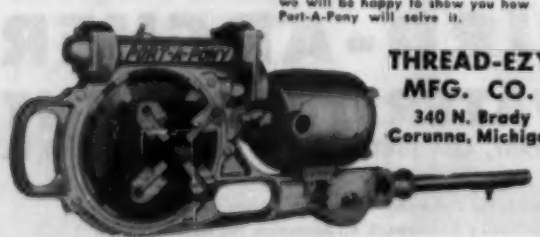
Send us your specific problem and we will be happy to show you how Port-A-Pony will solve it.



THREAD-EZY MFG. CO.
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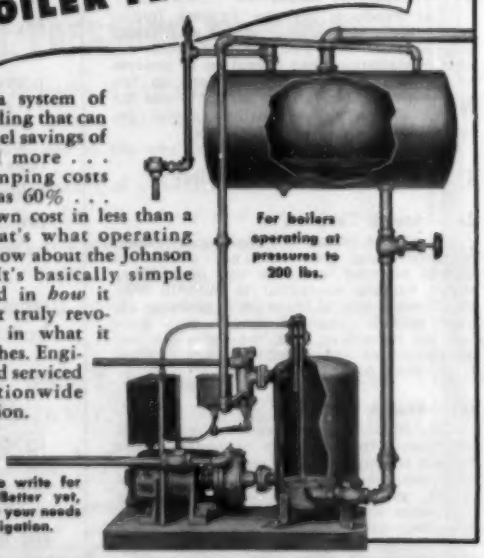
Imagine a system of boiler feeding that can achieve fuel savings of 20% and more . . . slash pumping costs as much as 60% . . . save its own cost in less than a year! That's what operating records show about the Johnson System. It's basically simple and sound in *how* it works, yet truly revolutionary in what it accomplishes. Engineered and serviced by a nationwide organization.



For boilers operating at pressures to 200 lbs.

Don't fail to write for the facts. Better yet, let us survey your needs without obligation.

The Johnson Corporation
807 Wood St., Three Rivers, Mich.

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379—Boiler Water Treatment

Difficulties caused through industrial water contamination are outlined in a 12-page catalog. Recommended water conditioning treatments for scale, sludge, corrosion, carryover and other boiler conditions, and efficient control methods are described. Details of a system of complete boiler water conditioning are fully explained. E. F. Drew & Co., Inc.

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Circle "key" numbers on Reply Card between pgs. 34/35 & 98/99. Your requests will be handled promptly.

380—Deaerators

Spray-atomizing type units are shown in cross-section in four-page booklet 400. Function, design and operation, construction, outstanding features, and uses are discussed. American Water Softener Co.

381—Boiler Water Foam

Laboratory pictures in this four-page folder show how Concentrol controls boiler water foam. Examples of its use in various industries are given along with an explanation of foaming. Bird-Archer Co.

382—Chlorinizers

Chlorination—the modern way to prevent slime buildup in condensers and heat exchangers—saves you money if its right. But if dosage is too heavy, you run the risk of corrosion, according to application memo 840-J9. Chlorinizers available in three volumetric models for feeding from a few pounds to 6000 pounds per day are described. Builders-Providence, Inc.

—*End*

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1. Contain lead-suboxide... Dependably protect against rust and corrosion.
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7. Are economical in cost... have long life... assure minimum maintenance.

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UNIT HEATERS
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BLAST COILS
trouble-free
heating service
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The reasons for this wide acceptance . . . GRID'S All-Cast construction having similar metals in contact with steam prevents electrolytic corrosion . . . GRID'S ability to withstand steam pressures up to 250# P. S. I. . . . GRID'S low outlet temperatures, proper fan sizes and motor speeds assure delivery of warm comfortable air in ample volume, directly to the spot where it is needed.

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ideas in action

—Starts on page 88

Hoppers unload into transfer cars and the cars into the bucket of either of two cupola skip hoists. A light goes on at the base of the skip hoist when the cupola charge falls below a certain level signaling the operator to start the bucket up the hoist. Feeders, transfer cars, and the skip hoist are all operated by electric motors.

Not only does this system, designed by Gifford-Wood Co., provide better working conditions and more accurate charging, but it is expected to pay for itself in about 2½ years.

Use of Dehumidifiers Saves Firm $4000 a Year

Savings of more than $4000 a year are being realized by Racine Hydraulics and Machinery Inc. through the use of eight Westinghouse Dehumidifiers in the basement storage area of their Racine, Wis. plant. This annual saving is more than four times as much as the original purchase price of the eight units.

The dehumidifiers prevent formation of rust on both finished products and parts awaiting assembly in the firm's 70,000-cu ft basement storage area by removing as much as 24 gal of water every 24 hours. Cost of operation is about the same as fifteen 100-w light bulbs.

William Reinhardt, Jr., plant superintendent, said the use of the dehumidifiers has not only resulted in the saving of money but also of time. In 1952, heavy rust damage resulted in costly de-rusting operations and production slowdowns. During 1953, with the Westinghouse units in operation, no appreciable rust damage was experienced.

Magnetic Separator Solves Abrasive Fines Problem

Abrasive metallic particles in the cutting oil of deep-hole drilling equipment at the Sheridan Products, Inc. plant at Racine, Wis. had, for some time, brought on repeated and expensive trouble.

In drilling the 5 in. barrels of the Sheridan .22 calibre pistols, coolant oil is pumped down through the drills

at a pressure of 500 to 600 psi, returns up along the flutes of the drills, passes through screens to remove the chips, and is then piped back to a reservoir for repumping. However, the screening operation did not remove the almost miscroscopic fines drilled from the gun barrels — chrome-moly steel of a .50 carbon content heat treated to 26 Rockwell "C" hardness.

The fines had an abrasive effect on the pumping equipment which made some pump parts very short lived. Wherever the oil current slowed down, the fines accumulated and formed a mass resembling a thick mud or solid. At the spindles, when this condition existed, it prevented the necessary free movement of the drill clutches, resulting in the breakage of expensive drills and excessive downtime. Fines also became embedded in the soft drill drives, shortening their useful life.

The solution consisted in installing an F-I-G permanent magnetic Ferrous Cleaner, made by Eriez Manufacturing Co., at a point in the line just prior to where the coolant oil returns to the reservoir for repumping. Periodically, the grid of the cleaner is simply lifted out of the unit and cleaned of accumulations.

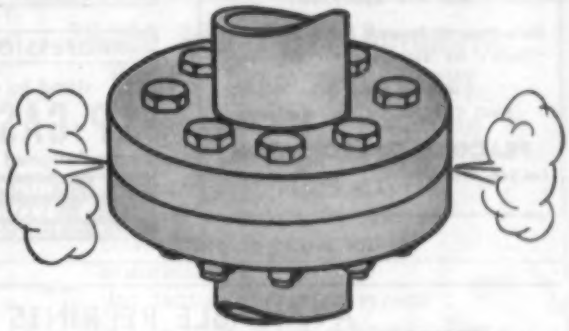
The Ferrous Cleaner is powered by non-electric permanent magnetic elements of Alnico, and is designed to remove fine iron contamination from liquids or — in conjunction with a vibrating feeder — from thin flows of powder.

meetings

. . . and exhibitions

Sept. 8-10	American Society of Mechanical Engineers (Fall Meeting)	Hotel Schroeder Milwaukee, Wis.
Sept. 12-16	American Institute of Chemical Engineers (Fall Meeting)	Colorado Hotel Glenwood Springs, Colo.
Sept. 12-16	Illuminating Engineering Society (National Technical Conference)	Chalfonte-Haddon Hall Atlantic City, N.J.
Sept. 15-17	Compressed Air and Gas Institute Meeting	Skytop Lodge Skytop, Pa.
Sept. 15-20	Instrument Society of America (International Instrument Exposition)	Convention Hall Philadelphia, Pa.
Sept. 27-29	American Institute of Electrical Engineers (Petroleum Conference)	Mayo Hotel Tulsa, Okla.
Sept. 28-Oct. 1	Association of Iron and Steel Engineers (Exposition)	Pacific Auditorium Cleveland, Ohio
Oct. 4-6	National Electronics Conf. (Tenth Annual Conference)	Hotel Sherman Chicago, Ill.

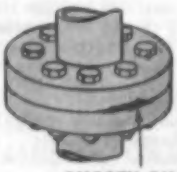
FLANGED JOINTS
which will not
LEAK



1 Make up your flanged joints with Smooth-On No. 3, heavy duty flange and gasket compound. The fine soft iron in this ready-to-use compound seals and protects. It will not bake out, it cannot be dissolved or driven away.

2 Pitted flange faces can be built up true with Smooth-On No. 1, THE iron cement. Finish with a coat of No. 3 on both sides of the gasket, and the joint is secure for very heavy duty.

3 Often a flanged joint may leak but it is impracticable to take it apart, at least not right away. Then force Smooth-On No. 1 into the leak. This hydraulic cement expands as it hardens, plugs any leak. All Smooth-On No. 1 asks is a firm surface against which to expand as it hardens.



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"Synchronous Motors Do Two Jobs"
"When to Use Eddy Current Couplings"
"Boiler Houses Are Not Necessary Evils"
"Power Distribution For Large Motors No Problem at Cement Plant"
"What Moisture Resistance Means in Cable Insulation"
"Selecting Corrugated Expansion Joints"
"Feedwater Heating Calculations For Steam Turbines"
"Coal Handling at Elrama Power Station"
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"Synchrotie Drives in Process Industries"
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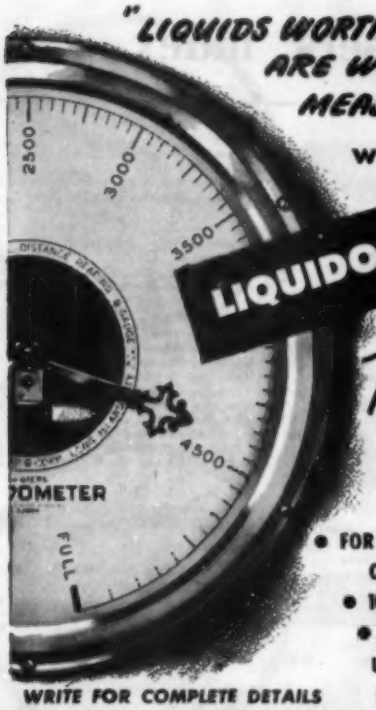

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WRITE FOR COMPLETE DETAILS

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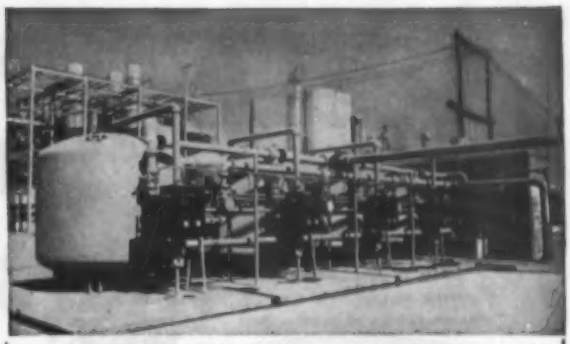

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VATS • TANKS • DRYERS
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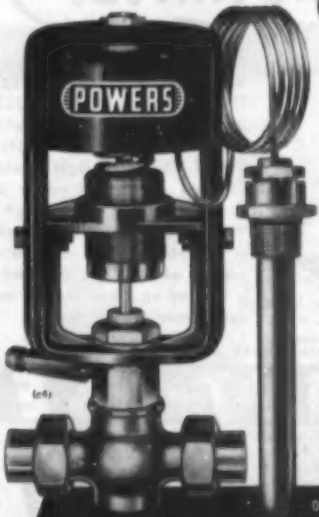
AND MANY OTHER USES



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"HI-TEMP"
C-5 THREAD COMPOUND
IS BEST FOR ALL STUD THREADS and STAINLESS STEEL APPLICATIONS

✓ speeds up dis-assembly time
✓ prevents stud breakage
✓ eliminates pitting of stainless steel

NO MORE FROZEN OR GALLED STUDS EVEN AT 1800°F

Let us SEND you a
FREE SAMPLE
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Conduct your own tests with C-5 "Hi-Temp" at our expense. Write on your company letterhead for Free Sample and complete data sheet TODAY!

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will meet your

FOT-Gage for furnace pressure or fuel flow – air flow indication

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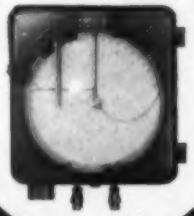

OT-Recorder for draft or pressure

requirements

D-Gage for commercial, institutional boilers and industrial furnaces

Whether you need a draft gage for the largest steam generator, or a small portable gage for spot checking pressure conditions, first or last, it will pay you to talk to Hays, manufacturer of the most complete line of draft and low pressure gages.

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Boiler Panels • CO_2 Recorders
Veriflow Meters and Veritrol
Gas Analyzers • Draft Gages
Combustion Test Sets
Electronic Oxygen Recorders
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Electronic Feed Water Controls
Miniature Remote Indicators

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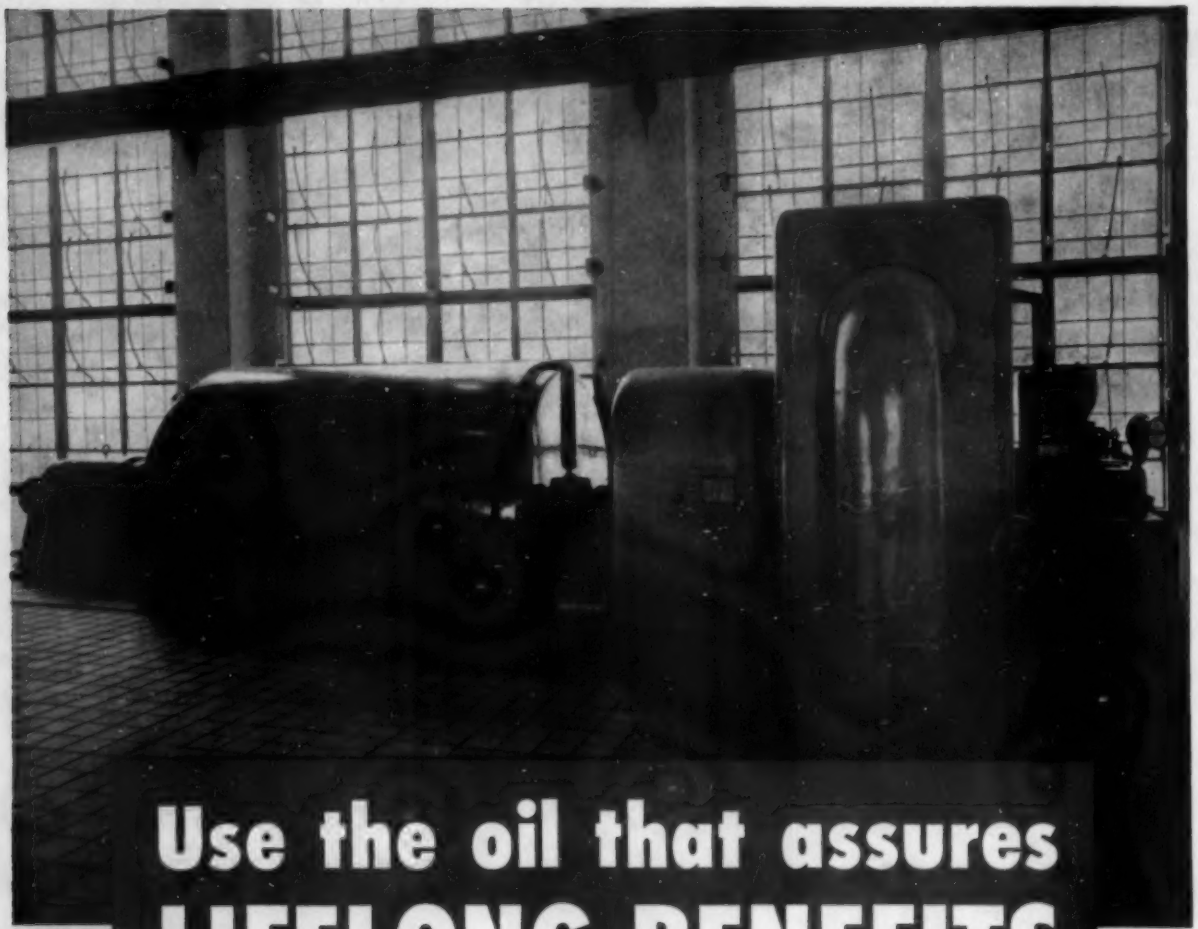

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